Revised 3/95

CORRES. CONTROL
INCOMING LTR NO.

00470 RF 99

DUE DATE

ACTION

5 MAY 99 11:

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I States Government

emorandum

Department of Energ

Rocky Flats Field Offic

MAY 04 1999

DIST.	LTR	ENC
BENSUSSEN, S.J.		
BOGENBERGER, V.		
BORMOLINI, A.M.		
BRAILSFORD, M.D.		
BURDGE, L.		
CARD, R.G.	X	
COSGROVE, M.M.		
COX, C.M.		
CRAWFORD, A.C.		
DEJONG, V.J.		
DERBY, S.		
DIETERLE, S.E.		
FERRERA, D.W.		
FERRERA, K.P.		
FULTON, J.C.		
GERMAIN, A.L.		
HARDING, W.A.		
HARROUN, W.P.		
HEDAHL, T.G.		
HILL, J.A.		
LEONARD, R.C.		
LEWIS, M.R.		
MARTINEZ, L.A.		
NORTH, K.		
PARKER, A.M.		
PHILLIPS, F.J.		
POLSTON, S.		
RODGERS, A.D.		
SANDLIN, N.B.		
SHELTON, D.C.	X	X
TUOR, N.R.		
VOORHEIS, G.M.		
Nesta, S	X	X

COR. CONTROL	X	X
ADMN. RECORD	X	X
PATS/T130G		

Reviewed for Addressee
Corres. Control RFP

5/6/99 Date

By

Ref Ltr. #

DOE ORDER # 5400.1

AMEI:ERWM:JCM:03367

Finding of No Significant Impact for Vegetation Management Activities

David Shelton, Vice President
Environmental Systems & Stewardship
Kaiser-Hill Company, L.L.C.

This memorandum transmits to your office the approved Finding of No Significant Impact for the Vegetation Management Environmental Assessment, EA-1293. Should you have any questions, please contact me at extension 5918 or John Morris of my staff at extension 7198.

Joseph A. Legare
Assistant Manager
for Environment and Infrastructure

Attachment

cc w/Att:
C. Borgstrom, EH-42, HQ
R. Tyler, ERWM, RFFO
K. Brakken, AI, RFFO
R. DiSalvo, OCC, RFFO
S. Nesta, K-H
T. Rehder, EPA
S. Tarlton, CDPHE
Administrative Record

DOE/EA-1293

The Rocky Flats
Environmental Technology Site

Vegetation Management Environmental Assessment

DEPARTMENT OF ENERGY
ROCKY FLATS FIELD OFFICE

April 29, 1999

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Introduction

The Rocky Flats Natural Resource Management Policy (1998) on vegetation and habitat management states that the Rocky Flats Environmental Technology Site (Site) will manage prairie habitat to maintain healthy, diverse native habitat and maintain habitat essential to endangered and rare species. Since 1990, the Site has experienced an invasion of noxious weed species that are degrading the buffer zone habitat. Six weed species (particularly diffuse knapweed, as well as Canada thistle, dalmatian toadflax, and musk thistle) have been encroaching on the disturbed and undisturbed areas of the buffer zone at a rapid rate. Monocultures of weeds, especially diffuse knapweed, have become established, crowding out native species. The Department of Energy is required to take action to control the spread of these weeds and reduce their populations on Site in order to maintain habitat quality and comply with several state and federal weed control statutes. This environmental assessment addresses the methodologies that the Site may use to control weeds and manage vegetation.

The undisturbed buffer zone is an area where naturally occurring fires have not been allowed to burn dead vegetation that has accumulated since about 1972. As a result, a fuel load of dead vegetation has been building up in the buffer zone for about 25 years. In order to maintain the grasslands at the Site at their most productive and diverse, stimulate stronger growth from native prairie species, and remove the fuel load from the buffer zone, the Department of Energy wishes to remove the accumulated buildup of dead vegetation from the prairie grasslands.

The analysis of impacts from vegetation management techniques addressed in this environmental assessment will be used to select an approved list of techniques that are suitable for use at Rocky Flats. A Vegetation Management Plan will be written upon completion of this environmental assessment and reviewed each year thereafter to identify the specific approved management activities that will be implemented each year.

This document is divided into four major sections: Background; Alternatives, which describes the three alternatives considered; Affected Environment, which describes the current physical conditions in the buffer zone; and Environmental Effects, which describes the consequences of implementing each of the three alternatives.

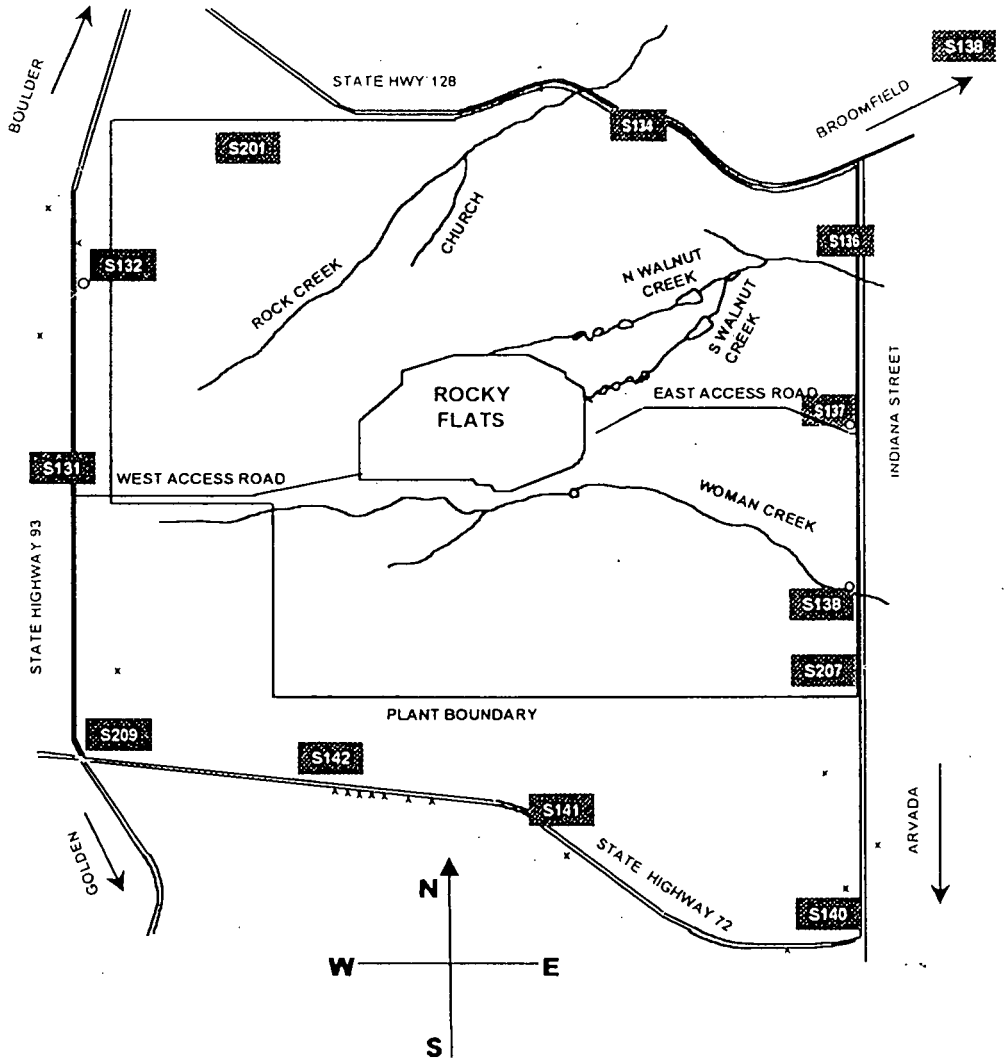
Background

The Rocky Flats Environmental Technology Site (formerly Rocky Flats Plant) has been a Department of Energy installation since 1952. Rocky Flats is located on approximately 6,266 acres in rural northern Jefferson County, Colorado, 16 miles northwest of Denver (Figure 1, Location Map). The Rocky Flats buffer zone occupies most of this acreage, about 5,800 acres. The developed portion of the Site, the industrial area, occupies approximately 400 acres in the middle of the Site.

For the most part, the acreage included in the buffer zone at Rocky Flats has been utilized as security buffer area and wildlife habitat since it was acquired. The area is relatively undisturbed compared to areas east and northeast of the Site. The buffer zone is traversed by maintained dirt or gravel roads. Environmental remediation work has disturbed less than 50 acres of the buffer zone.

Noxious weeds are defined as exotic plants that have been introduced into an environment where they are so successful that they displace native species and take over their habitat. State and Federal statutes identify noxious and undesirable plants and outline the Department's

Figure 1 Location Map



X Public Receptors

S142 Perimeter Radiation Sampler

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responsibility for management of noxious weeds. The main statutes applicable at Rocky Flats are the Federal Noxious Weed Act, the Colorado Weed Management Act, and the Federal Insecticide, Fungicide and Rodenticide Act. These statutes require federal agencies to identify noxious weeds that inhabit lands under their control and to take steps to control or eradicate noxious or undesirable plants to prevent their spread. They also require following label directions on commercially available pesticides.

The current, most widespread noxious weeds are not believed to have been a problem in the buffer zone in 1990. The results of vegetation monitoring surveys conducted in 1992, indicated that diffuse knapweed was found in several small areas on the western edge of the Site during that year (Figure 3). Noxious weeds were mapped in test plots further east in 1995, and the populations on Site have increased each year since that time (see Figures 4, 5, 7 and 8). Weeds are now a problem on approximately 90 percent of the buffer zone acreage.

Rocky Flats personnel conduct weed control activities yearly in the buffer zone. Currently herbicides, manual or mechanical removal, and biological controls are used to control the spread of weeds on approximately 260 acres in the buffer zone each year.

The weed problem is one the Site shares with its geographical neighbors. Boulder City Open Space, Boulder County Open Space, and Jefferson County Open Space have all shared information with the Site about the extent of the weed problems within their jurisdictions and their programs to control noxious weeds. The Site intends to continue this cooperative arrangement of sharing information, expertise, and resources.

Department of Energy hosted two public meetings were held in August and September 1998, to discuss vegetation management techniques and the issues and concerns that surround vegetation management at the Site. During the meetings, the participants developed a list of the management techniques that are available and could be utilized at the Site. The participants also identified impacts that should be addressed in the environmental assessment, and a list of concerns to be considered when annual vegetation management plans are produced. The management techniques, impacts, and concerns identified at the meetings are listed in Appendix A.

Five categories of vegetation management techniques were identified for analysis in this environmental assessment: 1) herbicide application; 2) biological controls; 3) mechanical controls; 4) cultural practices; and 5) prescribed fires. Table W-3 shows combinations of vegetation management techniques that will be analyzed to control weeds and reduce fuel loads at Rocky Flats.

Alternatives

Three alternatives have been developed for analysis in this environmental assessment. They cover a spectrum of activity levels from taking no vegetation management actions to combining a large number of vegetation management techniques that would be implemented in an integrated fashion. Brief descriptions of the three alternatives follow; Table A-1 shows the details of the alternatives and the vegetation management techniques that would be included in each alternative. The alternatives describe the maximum levels of activity that would occur under that alternative, for example maximum annual acreage of controlled burns. Selection of an alternative would result in the implementation of a combination of the activities that is equal to or less than the total level of activity identified in the alternative. Department of Energy prefers to be able to implement the options described in the Comprehensive Action alternative.

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1. No Action – The no action Alternative, represents a scenario where the Department of Energy would stop all vegetation management actions that currently take place at the Site. No control or removal of weeds would occur under this scenario.
2. Current Action – The current Action Alternative, represents a scenario of continuation of the vegetation management actions that Rocky Flats has undertaken in the past five years at the Site. The techniques that have been employed in the recent past, including use of herbicides, manual digging, mowing, and biological controls would continue to be used to remove or manage vegetation.
3. Comprehensive Action – The Comprehensive Action Alternative, represents a scenario in which Rocky Flats would increase the number of vegetation management techniques over the number currently in use. Actions under this alternative would include techniques currently in use at the Site, plus additional techniques that have not been used during the past five years. The major differences between the current action and comprehensive action alternatives is the addition of aerial spraying of herbicides and controlled burning of vegetation under the comprehensive alternative.

The impacts of implementing each of these alternatives are discussed in the section on environmental effects.

Options considered but not selected

The actions described below were suggested during the scoping process for inclusion in the vegetation management environmental assessment. The Department of Energy has considered the suggested actions and concluded that they should not be analyzed in the environmental assessment.

1. Construction of catch fences – Catch fences can be useful in an area where weeds are spread by blowing seed heads across uninfested ground. Fencing can be constructed to restrict the movement of blowing weeds and contain the seed source in a defined area. This action might have been effective in the buffer zone two or three years ago before diffuse knapweed and other weeds had made as much inroad into the buffer zone as they had in 1998. After consideration, DOE decided not to further analyze the construction of catch fences in the comprehensive alternative because weeds have already spread across the buffer zone. Fences in place within the buffer zone and at the site's perimeter that have been utilized as catch fences will be maintained. Construction of additional fences may become viable in the future if the weed problem is reduced to a point where fences could be selectively placed to help control small remaining weed populations.
2. Inoculate Soils – Inoculating soils with bacteria can improve the uptake of nutrients by plants (particularly trees) that form a symbiotic relationship with the bacteria. Soil inoculation can be a cost-effective method of stimulating plant growth in horticultural situations of limited size, but it has not been widely used in agriculture or rangeland management. DOE believes that soil inoculation would be cost prohibitive and of unproven benefit in areas requiring reclamation that cover several acres in the buffer zone. Soil inoculation has not been included in the comprehensive alternative for further analysis.

3. Wash vehicle tires – Vehicles that drive off road in weedy areas can pick up and transport weed seeds to uninfested areas and thus aid the spread of weeds. A tire washing station could reduce the number of weed seeds that are transported from one area to another on-site. However at Rocky Flats, where weeds have already migrated to virtually every part of the buffer zone, this action would have an unnoticeable effect on controlling the spread of weeds. Therefore, this option has not been further analyzed in the environmental assessment.
4. Application of fertilizers – Application of fertilizers in agricultural situations is a common practice to increase the levels of nutrients in the soil available to plants to increase their productivity. Native rangeland plants have evolved without the benefit added nutrients and are adapted to the conditions existing in the buffer zone. The Department of Energy believes that application of fertilizers may benefit invading weed species more than the native plants in newly seeded areas. Therefore this option has not been included in the environmental assessment for further analysis.
5. Use bacteria or viruses for biological controls – Inquiries into this proposal revealed that no bacterial or viral agents have been approved for commercial use in the control of weeds. Therefore this suggestion has not been analyzed in the environmental assessment.
6. Mow tall grass prairie to remove vegetation – This proposal is to mow prairie grass communities to cut down weeds and the upright portions of previous years' growth of native vegetation to increase the light levels available to seedlings and slow the accumulation of fuel loads in prairie plant communities. Unless the cut portions of the plants were also gathered and removed, they would add to the thatch accumulations already in place. Mowing to remove weeds in flower before they set seed would also remove the flowers and seeds of some native plants. Mowing after native plants have set seed would also allow ample time for weed species to complete their seed production cycles. Rocky surfaces, uneven ground, steep slopes, and unstable soils would all hinder mowing to remove thatch from around bunchgrasses. The Department of Energy considers the benefits of mowing and gathering large quantities of vegetation to be offset by the uncertain benefits. This option was not included in the alternatives in the environmental assessment.
7. Introduce wild or domestic grazers – This suggestion would involve stocking the buffer zone with domestic animals, such as cattle, buffalo, sheep or goats, or transplanting wild grazers, such as elk. With intensive management, domestic grazers might be effective on reducing weed populations in selected areas. However, without intensive management, cattle can be very detrimental to riparian areas, and in this case, Preble's mouse habitat. Buffalo are difficult to confine in a restricted area, and controlling them would require an upgraded fencing system within the buffer zone. Goats can be persuaded to eat noxious weeds if they are confined in a small area with heavy concentrations of weeds, but they will not selectively choose weeds over desirable native forbs. Rocky Flats is probably not a good candidate for transplanting elk because it does not offer year round habitat, and animals would not be expected to remain on-site. All of these grazing options represent actions that Rocky Flats is not presently staffed or equipped to implement. The Department of Energy chose not to include this suggestion in the analysis in the alternatives.

Table A-1
Alternatives to be Analyzed

	No Action	Current Action	Comprehensive Action
Herbicide application			
truck mounted spray	none	truck mounted spray on approximately 250 acres per year	truck mounted spray on approximately 250 acres per year
spot spray	none	spot spray 10-15 infestations under one acre occur	spot spray 10-15 infestations under one acre occur
aerial spray	none	none	aerial spray up to 1500 acres per year
wick application	none	none	treat 10-15 isolated populations less than one acre per year
Biological controls			
release insects	none	release an average of 1 species of insects per year	release an average of 1 species of insects per year
introduce wild grazers	none	none	none
graze domestic livestock	none	none	none
use bacteria or viruses	none	none	none
Cultural practices			
apply fertilizers	none	none	none
reseed disturbed areas	none	reseed 1-15 acres of disturbed areas with native seed each year	reseed 1-15 acres of disturbed areas with native seed each year
till and reseed	none	none	till and reseed areas where native vegetation is thin as a result of herbicide use, controlled burns, or wear and tear up to 20 acres annually
inoculate soils	none	none	none
mow tall grass	none	none	none
mulch	none	mulch up to 15 acres that have been reseeded per year	mulch up to 35 acres that have been reseeded per year.

Table A-1
Alternatives to be Analyzed

Mechanical controls			
mowing roadsides	none	mow 10 miles of roadsides annually	mow 10 miles of roadsides annually
gathering weeds	none	annually gather 25-30 cubic yards weeds that have accumulated along fences; dispose of them as sanitary waste	annually gather 25-30 cubic yards of weeds that have accumulated along fences; dispose of them by burning
grading roads	none	grade 25 miles of roads in the buffer zone annually	grade 25 miles of roads in the buffer zone annually
hand pulling	none	hand pull 10-15 small infestations of less than ¼ acre or in areas where herbicides cannot be used annually	hand pull 10-15 small infestations of less than ¼ acre or in areas where herbicides cannot be used annually
wash vehicle tires	none	none	none
construct catch fences	none	none	none
Prescribed fires			
spot burns	none	none	spot burns of wind blown weeds along up to 6 miles of fence line per year
area burns - spring	none	none	area burns in spring up to 500 acres per year

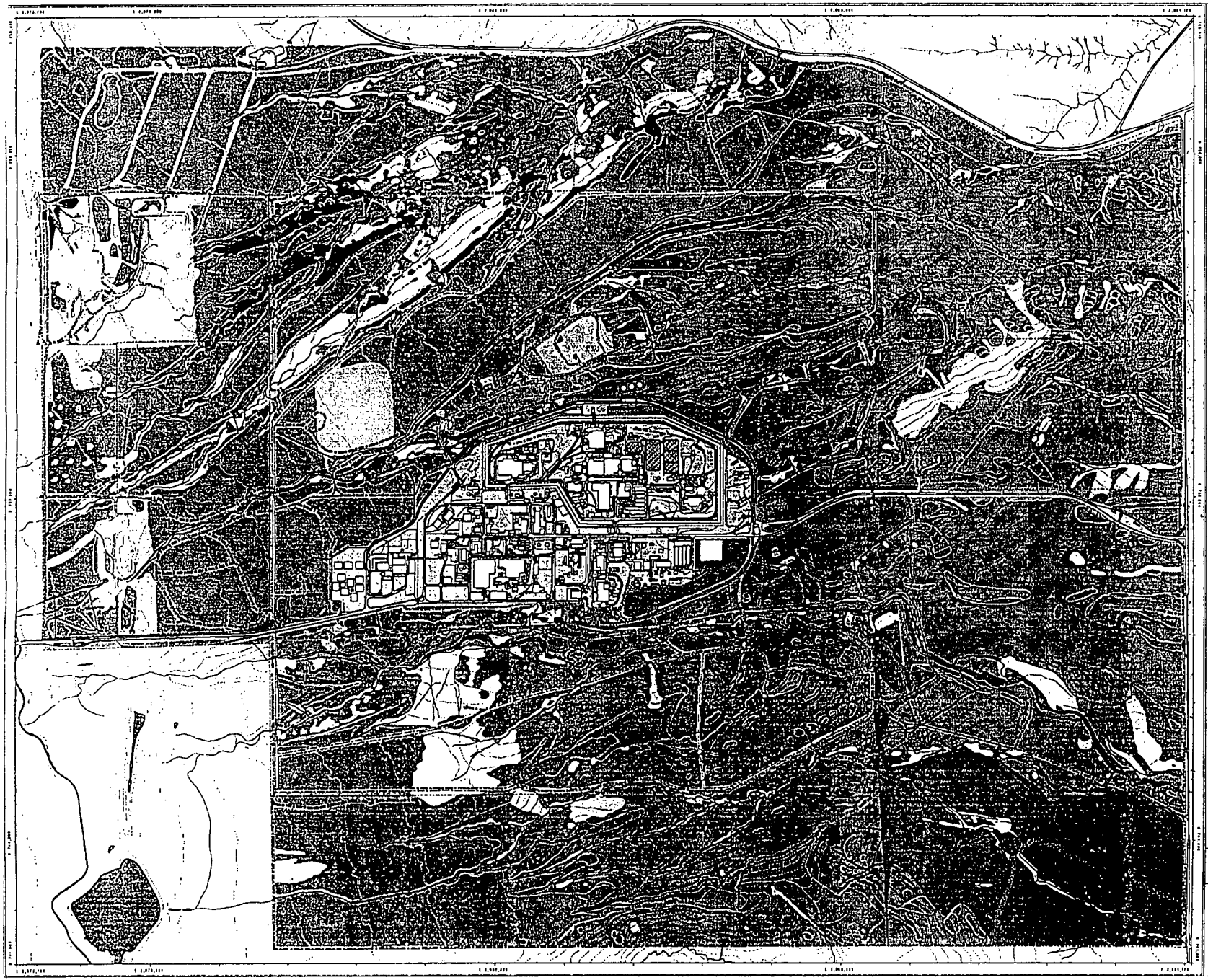
Affected Environment

Vegetation

The Site has mapped 18 major vegetation communities as well as open water, developed areas, and other disturbed areas (Vegetation Types 1996). To simplify the discussion for this document, the vegetation communities have been combined into seven general classifications, which are described in Table V-1 below and presented on Figure 2, Rocky Flats Vegetation Types Map.

Table V-1
Vegetation Communities

Community	Representative species present	Acreage at Rocky Flats	Priority 1 Weed Invaders[1]
Xeric Grasslands	big bluestem, little bluestem, needle-and-thread, mountain muhly, sedge, Fendler sandwort, Porter's aster, junegrass, blazing star, yucca, Indian-grass prairie dropseed, switchgrass, New Mexico feathergrass, scattered stands of ponderosa pine, occasional Douglas-fir	2010	Canada thistle Dalmatian toadflax diffuse knapweed musk thistle Scotch thistle
Mesic Grasslands	western wheatgrass, Kentucky bluegrass, blue grama, green needlegrass, Canada bluegrass, Japanese brome, alyssum, buffalograss, annual sunflower, occasional stands of snowberry and wild rose	2360	Canada thistle Dalmatian toadflax diffuse knapweed Russian knapweed musk thistle Scotch thistle
Tall Upland Shrublands	hawthorn, chokecherry, wild plum, skunkbush sumac, currants	65	Canada thistle Dalmatian toadflax diffuse knapweed musk thistle Scotch thistle
Great Plains Riparian	plains cottonwood, peach-leaved willow, Siberian elm, white poplar, chokecherry, wild plum, snowberry, coyote willow, leadplant, and associated forbs	70	Canada thistle Dalmatian toadflax diffuse knapweed musk thistle
Wetlands	redtop, prairie cordgrass, Canada bluegrass, western wheatgrass, showy milkweed, Missouri iris, dockweed, meadow arnica, sedges, rushes, cattails, bulrushes, barnyard grass, smartweed	420	Canada thistle, Scotch thistle
Reclaimed Grassland	smooth brome, intermediate wheatgrass, crested wheatgrass, sweet clover, field bindweed	645	Canada thistle Dalmatian toadflax diffuse knapweed musk thistle Scotch thistle
Disturbed Areas	cheatgrass, Japanese brome, diffuse knapweed, Russian thistle, musk thistle, kochia, and annual sunflower	875	Canada thistle Dalmatian toadflax diffuse knapweed musk thistle Scotch thistle



1998
Rocky Flats Vegetation Types Map
(Modified Classification)

MAP LEGEND

Standard Map Features

- Xeric Grasslands
- Mesic Grasslands
- Reclaimed Grasslands
- Great Plains Riparian
- Wetlands
- Tall Upland Shrublands
- Disturbed Areas
- Open Water
- Buildings and other structures
- Solar evaporation ponds
- Lakes and ponds
- Streams, ditches, or other drainage features
- Fences and other barriers
- Contour (20-Foot)
- Paved roads
- Dirt roads

DATA SOURCE:

NOTE:

Figure 2

Scale = 1:21,330
1 inch represents approximately 1,778 feet

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD 27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

EXponent

MAP ID: [illegible]

November 09, 1998

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Grassland Communities

Native grassland communities are considered sensitive habitats at the Site primarily because of documented or potential importance to species of special concern. Additionally, the Colorado Natural Heritage Program believes that the Rocky Flats unit of xeric tallgrass prairie is the largest example of xeric tallgrass prairie remaining in Colorado, and perhaps North America, and has strongly recommended that adequate steps be taken to preserve it. These are generally high-quality examples of habitats that have been destroyed by agriculture or development throughout most of the Front Range Urban Corridor.

A combined area of 4,372 acres (70% of the Site); is dominated by grasslands. Although the grassland may appear uniform from a distance, it is complex in terms of species composition and wildlife use. The native grassland at the Site has been grouped into two general communities: xeric grassland (2,011 acres) and mesic grassland (2,360 acres).

Development of xeric (dry) and mesic (medium moisture) grasslands are dependent on soil type and moisture availability. Xeric grassland is represented by three communities: xeric tallgrass prairie; needle-and-thread grass prairie; and ponderosa pine woodland as small inclusions in the grasslands. Xeric tallgrass prairie is dominated by big bluestem, little bluestem, mountain muhly, Fendler sandwort, and Porter's aster. The needle-and-thread grass prairie is dominated by needle-and-thread grass and New Mexico feathergrass. The ponderosa pine stands are inclusions in these dryland areas. Mesic grasslands are dominated by species that require more water, such as western wheatgrass, Kentucky bluegrass, blue grama, green needlegrass, and Canada bluegrass. This community has inclusions of shortgrass prairie represented by buffalograss and blue grama. There are also occasional stands of snowberry and wild rose.

Xeric grassland generally occurs on the pediments and narrow ridgetops that extend along drainage divides. Most grasses in this community are bunchgrasses, and the forbs are perennial tuft-like plants. Between the plants, rock and soil is exposed. The soil in these areas is derived from Rocky Flats Alluvium, which forms sandy clay loams with abundant cobbles. These rocky soils have never been tilled. While the cobbly surface dries rapidly, the tallgrass prairie species persist due to the high water table. The tallgrass species in this plant community provide the preferred habitat for the grasshopper sparrow, a species that is declining throughout most of its range. Many other typical grassland bird species also nest and forage seasonally in this community. The eastern short horned lizard, a special-concern species, is common in this grassland unit.

Mesic grassland is the most extensive community at the Site, and generally dominates hillsides and valley floors along drainages. The grasses in this community are turf-like, with different species intermingling in a nearly continuous ground cover. These plants are prolific producers of biomass, and plant litter provides additional inert ground cover. Little bare soil is exposed in these grasslands. The Site's mesic grasslands provide important habitat for some declining bird species, special-concern species, rare plants, raptors, and many of the Site's mammals. The south-facing hillsides are particularly important winter range for the Site's mule deer. Because of the southern exposure, snows melt off rapidly, and the incident sun provides enough energy to keep several species of plants green throughout the winter. The greater warmth and available forage in these areas provides a survival advantage to the deer. This community occupies areas of reworked alluvium and underlying parent material. Depending on the specific site, higher soil moisture may result from factors such as subirrigation of the coarse valley bottom

B

alluvial soils, snow accumulation, northerly aspect, protection from drying winds, or mulching effect from turf-like vegetation and plant litter.

Tall Upland Shrublands

The tall upland shrubland community reflects an eastward extension of the foothill environment. This community was identified by the Colorado Natural Heritage Program as unique, with only one other similar community type in Montana. This community type is found only in the near vicinity of Rocky Flats. Tall upland shrublands are dominated by hawthorn, chokecherry, wild plum, wild rose, and currants; with a wide variety of prairie and montane plant species as understory and in associated grasslands. The shrublands occur as thickets along hillside seep lines, particularly in Rock Creek above the valley floor. Mountain maple also occurs in some of the shrubland units on the rocky hillsides. The presence of this community seems to be controlled primarily by the steeper terrain, rockier substrate, and greater abundance of hillside seeps along Rock Creek than the other drainages. In more easterly portions of Rock Creek on-site, where the valley is broader and shallower, the tall shrubs are replaced by lower-growing species, particularly skunkbush sumac, mountain ninebark, and snowberry.

Many of the plants found in the Rock Creek drainage are also found in tributary stream valleys closer to the foothills. Consequently, in addition to prairie species, the tall upland shrublands support a variety of wildlife more normally associated with foothill environments. Although this community covers only a small portion of the Site (1%), it provides habitat for a large number of species that contribute to the impressive species diversity at the Site. Examples include the yellow-breasted chat, black-capped chickadee, song sparrow, white-crowned sparrow, and green-tailed and rufous-sided towhees. The tall shrubs also provide important fawning and winter thermal cover for deer. The combination of dense cover, rugged terrain, and a larger prey base appear to make the Rock Creek drainage the portion of the Site where predators such as mountain lions and bobcats are most likely to occur. When black bears have been present on the Site, they have frequented this community for the chokecherries in August and September. The abundance of surface water and thick shrub cover contribute to this community's suitability as Preble's meadow jumping mouse habitat.

Great Plains Riparian

Riparian (streamside) trees and shrubs dominate portions of the valley floors in all of the on-site drainage basins. Trees in the riparian community include plains cottonwood, narrowleaf cottonwood, peachleaf willow, white poplar, and Siberian elm. Associated riparian shrubs include coyote willow, alder, wild rose, and leadplant. Snowberry is often found fringing the outer edge of this community on the surrounding uplands. A variety of herbaceous plants and grasses are found interspersed with the woody species that dominate this plant community. The riparian community forms a narrow band surrounding the streams, and although the acreage is small (1% of the total acreage), the habitat is important to wildlife at the Site.

Riparian areas are considered sensitive wetland habitats; they support a variety of wildlife that would not otherwise be found on-site. A number of species found in this habitat are special-concern species (e.g., loggerhead shrike, Swainson's hawk, northern leopard frog). This community provides one of the habitats for the Preble's meadow jumping mouse, listed as a threatened species. Large riparian trees such as cottonwoods provide essential perching and

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nesting sites for raptors. This community provides habitat for the greatest diversity of birds, supplying nesting and foraging cover for many woodland species, and other needs of birds using the surrounding grasslands. Many small mammals also inhabit this habitat, providing a food source for raptors and mammalian predators. Larger mammals such as mule and white-tailed deer rely on this community for food and cover part of the year. Most of the Site's reptiles and amphibians are also dependent on this community for portions of the year.

Wetlands

Wetlands at the Site include tall marsh, short marsh, and wet meadow. (The Great Plains riparian community is also classified as a wetland, but because it provides different habitat, and has a very different structural character, it is discussed separately.) Wetlands generally occur along pond edges, streams, ditches, and persistent seeps. Dominant species include cattails, bulrushes, sedges, rushes, redtop, prairie cordgrass, showy milkweed, swamp milkweed and Canada thistle. Tall marsh is typically associated with permanently saturated or inundated areas such as pond margins, stream pools, and permanent seeps and springs. Short marsh is more commonly associated with seasonally inundated or saturated areas, such as hillside seeps. Wet meadows occupy areas that are intermediate in soil moisture (the ecotone) between short marsh and mesic grasslands and contain elements of both. Prevalent species may include Kentucky bluegrass, prairie cordgrass, and redtop along with rushes, sedges, and mesophytic (moisture-adapted) forbs.

Like most native habitats in the Front Range urban corridor, wetlands are increasingly threatened by development pressure. Various types of wetlands provide habitat to red-winged and yellow-headed blackbirds, common yellowthroats, and song sparrows. Some of the tall marsh communities around ponds on-site also support nesting waterfowl and other wetland species and provide forage and cover for muskrats and black-crowned night-herons. Amphibians such as the Woodhouse's toad, northern leopard frog, and boreal chorus frog, all of which breed on-site, also use tall marsh plants along ponds or springs for cover, as may various species of shrews. The Preble's meadow jumping mouse uses wetlands where they are contiguous with its known habitats (Great Plains riparian and tall upland shrubland).

Ute ladies-tresses, a federally listed threatened plant species, has been found in large numbers on City of Boulder Open Space north of the Site and near Clear Creek to the south. The species typically occurs in moist meadows near streams, ponds, and springs. The most suitable areas at the Site are low swales in the Rock Creek drainage and in the vicinity of seeps along the western portion of Woman. Although apparently suitable habitat occurs on-site, Ute ladies-tresses were not found during intensive surveys performed in 1992, 1993, and 1994.

Reclaimed Grassland

Reclaimed grassland, occupying 10% of the Site, reflects prior attempts to rehabilitate lands disturbed during Site construction or previous agricultural activities. The most common species are three non-native grasses: smooth brome, intermediate wheatgrass, and crested wheatgrass. Many of the stands are nearly monotypic (one-species) communities. Associated forbs include yellow or white sweet clover, which may have been planted with the grasses, and aggressive weeds such as alyssum, Dalmatian toadflax, and field bindweed. While wildlife species do use the reclaimed grasslands to a limited degree, the diversity and densities of all species in these areas is lower than in native grasslands.

Disturbed Areas

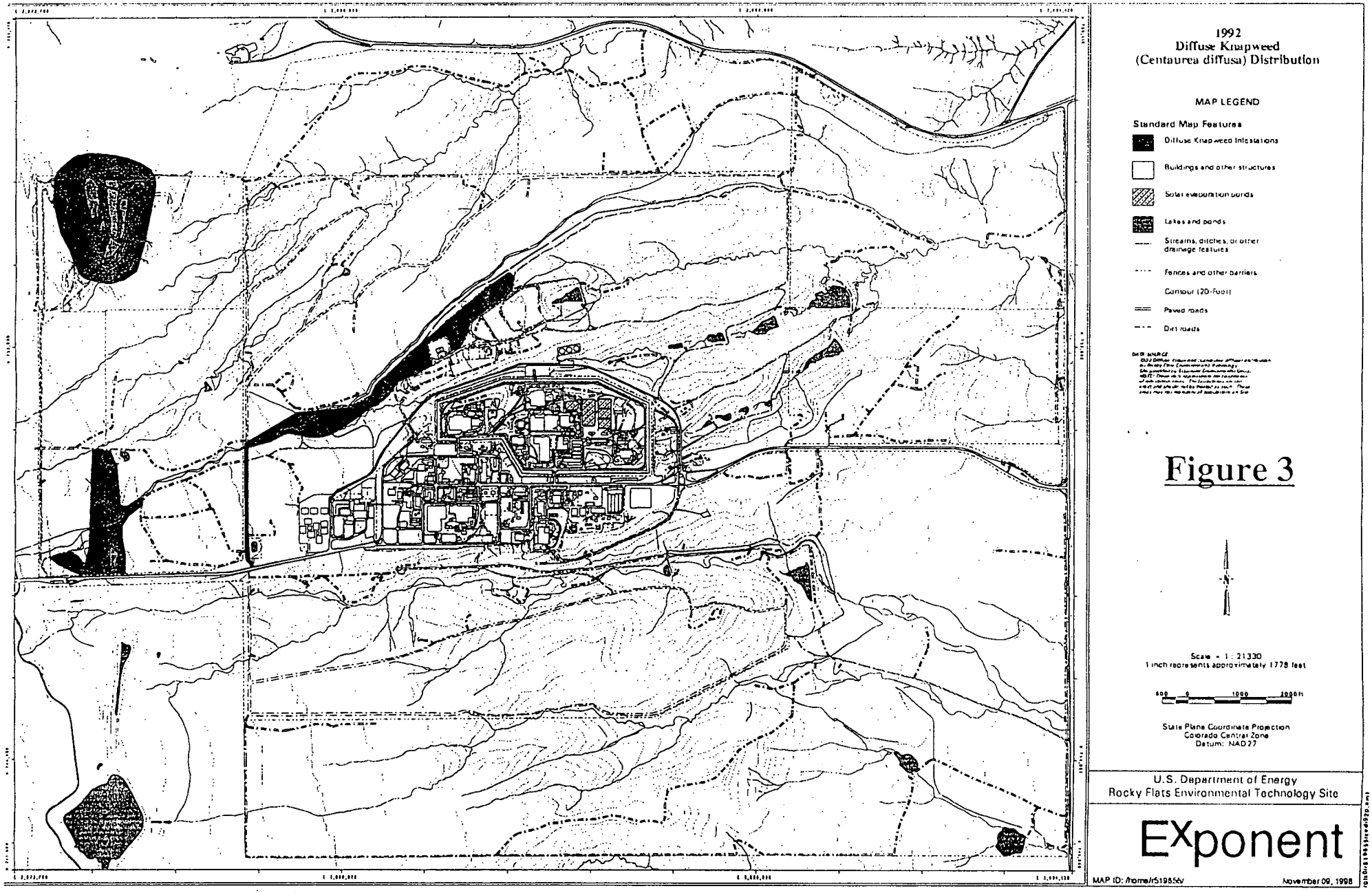
Some disturbed areas at the Site have not been reclaimed and continue to support sparse or weedy vegetation. Disturbed areas include areas that are essentially devoid of vegetation as a result of prolonged, frequent, or recent disturbance. Other disturbed sites variously support annual grasses (especially cheatgrass and Japanese brome) or annual/biennial forbs. Among the latter are diffuse knapweed, musk thistle, kochia, Russian thistle, tumble-mustard, flixweed, hoary cress, alyssum, annual sunflower, and Canada thistle.

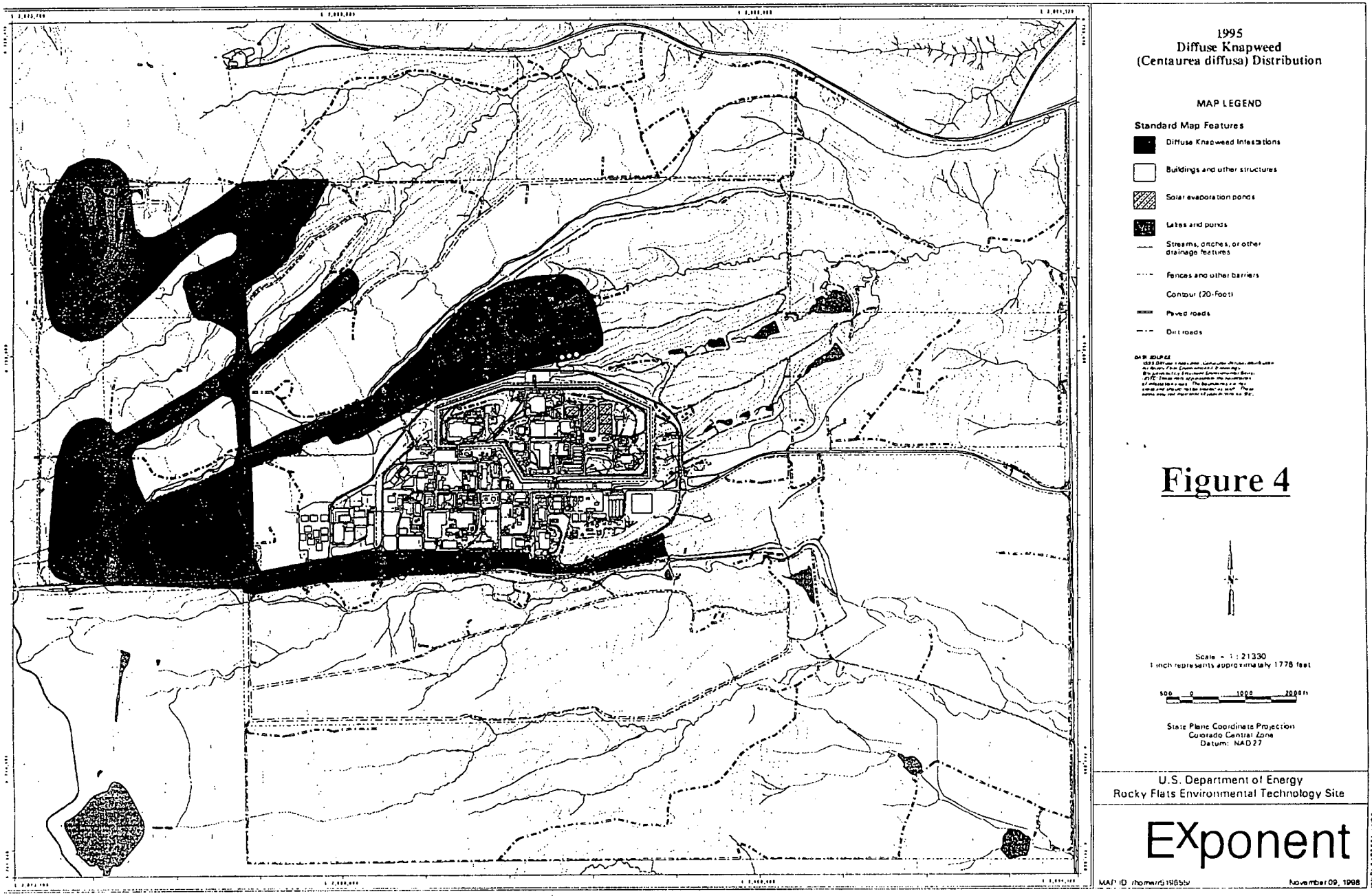
Some examples of recently completed revegetation projects are the C-1 Pond Road, the old landfill, portions of the shooting range, culvert replacement areas in the Buffer zone, the Central Avenue tank removal project, the mound plume treatment trench area, reseeding the OU1 French drain reclamation area, and a few small roadside disturbances that were hand seeded. Areas scheduled for revegetation in fiscal year 1999 upon project completion include the T-1 Trench area, the McKay Bypass Pipeline, the East Trenches Plume treatment trench site, the Solar Ponds Plume treatment trench Site, and perhaps a few building locations if there is no under building residual contamination after decontamination and decommissioning.

Weeds

Weeds have become a part of the landscape at Rocky Flats, and their populations and areal extent have increased markedly in the past five years, particularly diffuse knapweed. The vegetative communities at the Site are all being invaded by noxious weed species as shown in Table V-1. The extent of the invasion of each weed as a percentage of the total vegetative cover varies widely from community to community. In some cases, weeds have crowded out native vegetation completely and formed monocultures of one weed species. Although at least one of the Priority 1 weed species exists in all of the seven general plant communities shown on Figure 2, the extent of their populations and the density of infestation is not the same in all of them.

One goal of vegetation management at the Site is to control the spread of noxious weeds and reduce their populations where it is possible. Eradication of weeds is desirable but not feasible. Once some alien weed species have become well established in an area, they can never be fully eradicated but can only be controlled to reduce their numbers and stop their spread. Some species are more of a problem than others because of their ability to spread quickly and inhibit the growth of desirable native species. A dramatic example of how fast a weed infestation can move in a relatively short timeframe is illustrated on Figures 3, 4 and 5 which show the spread of diffuse





18 Best Available Copy

1998
Diffuse Knapweed
(Centaurea diffusa) Distribution

MAP LEGEND

Standard Map Features

- Diffuse Knapweed Infestations
- Herbicide Treated Clean Areas
- Buildings and other structures
- Solar evaporation ponds
- Lakes and ponds
- Streams, ditches, or other drainage features
- Fences and other barriers
- Contour (20-Foot)
- Paved roads
- Dirt roads

NOTE:
Only selected herbicide treated areas are shown on this map.

Figure 5

Scale = 1 : 21330
1 inch represents approximately 1778 feet

500 0 1000 2000 ft

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

EXponent

MAP ID: /home/r5/19655/

November 10, 1998

uranium-235, and 1.09 pCi/g for uranium-238. Uranium has been found on occasion at levels indicative of "hot spots." For example, removal of uranium-contaminated soil hot spots occurred at OU1 (881 Hillside) in 1994.

Surface Water

The Site is situated within the headwaters of two regional drainage basins: Boulder Creek basin and Big Dry Creek basin. Three intermittent streams within these basins drain the Site: Walnut Creek, Woman Creek, and Rock Creek. Walnut Creek and Woman Creek flow eastward across the central and southern portions of the Site, respectively, and are within the Big Dry Creek basin. Rock Creek drains the northern portion of the Site and flows northeastward into the Boulder Creek basin (creeks are shown on see Figure 1). In general, streams at the Site gain water during the spring due to precipitation, recharge, and rising ground water levels. Streams lose water during late summer and autumn due to diminished precipitation, infiltration into unsaturated channel material, and falling ground water levels. Stream channels at the Site are often dry in the late summer and autumn.

Seeps and springs are common along the upper margins of the drainages. Seeps discharge ground water to surface water and soils at the Site. Discharges from most seeps at the Site are not controlled. However, where there is the potential for contamination, seep discharges are monitored and in some cases treated.

Surface water in Walnut Creek and Woman Creek drainages is collected and analyzed in a series of detention ponds prior to being discharged from the Site. The water is managed using a batch discharge system. The stream channels below each pond are usually dry or almost dry except during a batch release.

Detectable levels of contaminants and occasional exceedances of stringent stream standards are possible at the Site due to its industrial setting and multiple pond inflows. Prior to discharging water from the Site's terminal ponds (A-4, B-5, and C-2), samples are taken and analyzed by the Colorado Department of Public Health & Environment. Water discharges are monitored to ensure compliance with the Site's NPDES permit for levels of plutonium, americium, uranium, tritium, pH, gross alpha/beta, and total suspended solids. In addition, this water is monitored for volatile organic compounds, chlorinated herbicides, semivolatile compounds, nitrates, nitrites, and other contaminants. The ponds are monitored daily, weekly, or monthly depending on the chemical or parameter for which analyses are required. Flow weighted samples are collected continuously and analyzed for radionuclides in accordance with the monitoring protocols described in the Rocky Flats Cleanup Agreement or the Integrated Monitoring Plan appendix to the Rocky Flats Cleanup Agreement.

The release of chemical pollutants into waters immediately adjacent to the developed portion of the Site is monitored under the Site's NPDES permit, which requires routine monitoring of point source discharges and reporting of results. Chemical and biological constituents are measured in surface-water effluent samples. The concentrations found in the samples are indicative of the overall quality of effluent discharges.

The potential for contaminant transport in surface water is greatest during storm events and other periods of high flow. Storm water quality and quantity are measured with 32 stream gauging stations dispersed across the Site. The stream gauges are equipped with continuously

20

knapweed from 1992 to the present. The acreage where diffuse knapweed is growing has increased from approximately 186 acres in 1992 to approximately 3204 acres in 1998.

Infestation areas are classified into general density categories of high, medium, low, and scattered, based on an interpretation of the extent, visual density, need for control, and the aggressive nature of the species. In general, a high density category indicates an area that is dominated by a nearly solid infestation of the species. A medium density category was used where the infestation provides less cover and was less homogeneous in the distribution of the species. The low density category is used where the species was present in fewer numbers but is not visually dominating the landscape. The scattered density category is used only in a few cases and indicates a sporadic occurrence of the species.

The boundaries shown on the weed maps are approximate and are based on professional judgement. No surveying or global positioning system equipment was used to locate boundary edges. The results of the 1998 mapping will be reported in the 1998 Annual Vegetation Report currently in draft and due to be final in June 1999.

The weed species in the Table W-1 occur at Rocky Flats and are targeted for control because they are listed as noxious weeds in the State of Colorado. Within this Site list, priorities have been set for control of target weed species based on current infestation levels and the aggressiveness of invasion by these species on-site. While some recently discovered species, such as Russian knapweed and Scotch thistle, do not yet occupy large acreages, they are listed as Priority 1 species due to the difficulty of controlling them and/or their ability to rapidly colonize vulnerable areas.

Noxious weeds have been placed into three priorities: Priority 1 (in need of aggressive, immediate control), Priority 2 (in need of periodic evaluation and may need specific control if populations change), and Priority 3 (receive incidental control). Also included is a list of weeds that occur at the Site in small numbers and have a potential to become more of a problem. Other state listed noxious weed species that are not residents at Rocky Flats now are known to occur on lands adjacent to the Site. They would become problems in the future and require control if they become established on the Site.

Table W-1
Priority for Control of Weed Species

Priority 1 Weed Species at the Site	Priority 2 Weed Species at the Site
Canada thistle (*Cirsium arvense*)	Common mullein (*Verbascum thapsus*)
Dalmatian toadflax (*Linaria dalmatica*)	Dame's rocket (*Hesperis matronalis*)
Diffuse knapweed (*Centaurea diffusa*)	St. Johnswort (*Hypericum perforatum*)
Musk thistle (*Carduus nutans*)	Field bindweed (*Convolvulus arvensis*)
Russian knapweed (*Centaurea repens*)	Hoary cress or Whitetop (*Cardaria draba*)
Scotch thistle (*Onopordum acanthium*)	Jointed goatgrass (*Aegilops cylindrica*)
	Kochia (*Kochia scoparia*)
	Oxeye daisy (*Chrysanthemum leucanthemum*)
	Puncturevine (*Tribulus terrestris*)
	Quackgrass (*Agropyron repens*)
	Saltcedar (*Tamarix ramosissima*)
	Yellow toadflax (*Linaria vulgaris*)

Priority 3 Weed Species at the Site	Potential Problem Species at the Site
Flixweed (*Descurania sophia*)	Alyssum (*Alyssum minus*)
Downy Brome (*Bromus tectorum*)	Annual rye (*Secale cereale*)
Houndstongue (*Cynoglossum officinale*)	Gumweed (*Grindelia squarrosa*)
Blue mustard (*Chorispora tenella*)	Intermediate wheatgrass (*Agropyron intermedium*)
Bouncingbet (*Saponaria officinalis*)	Japanese brome (*Bromus japonicus*)
Bull thistle (*Cirsium vulgare*)	Smooth brome (*Bromus inermis*)
Chicory (*Cichorum intybus*)	Wild lettuce (*Lactuca serriola*)
Common burdock (*Arctium minus*)	Yellow sweetclover (*Melilotus officinale*)
Green foxtail (*Setaria veridis*)	
Filaree (*Erodium cicutarium*)	
Russian thistle (*Salsola iberica*)	

Most of the weed control resources expended in the buffer zone at the Site are concentrated on the Priority 1 species since they pose the greatest threat to native plant communities at this time. Many of the species listed as Priority 2, Priority 3, and the potential problem species are found in areas also being invaded by Priority 1 species. Controls applied to Priority 1 weeds would also be applied to the other weeds, as well as desirable plant species. It is likely that weed control priorities will change over time if the Site is able to significantly reduce the populations of weeds currently listed as Priority 1 weeds.

Table W-2 below contains general information about each of the Priority 1 weeds at the Site. In order to develop a plan to control weeds, it is important to understand their characteristics and life habits. Reducing seed production is one of the best methods of controlling weeds that reproduce primarily from seed each year, but it is not particularly effective against weeds that spread mainly by extending their root systems and sprouting new plants. Many weeds spread by using more than one reproductive method.

Table W-2
Priority 1 Weed Biographies

Weed Name	Plant Life Habit	Reproductive Method	Favorite Habitat
diffuse knapweed (Figure 3, 4, & 5)	annual or biennial	wind blown tumbleweed, animals	dry rangeland to roadside ditches and disturbed areas
Russian knapweed (Figure 9)	creeping perennial	spreading roots and seed, animals	disturbed and waste areas, roadsides, rangeland
musk thistle (Figure 7)	biennial, winter annual	wind or water dispersed seed	dry to moist rangeland, roadsides, degraded pasture
Dalmatian toadflax (Figure 8)	perennial	creeping roots and seed	dry rangeland, arid sites
Canada thistle (Figure 6)	creeping perennial	creeping roots, wind or water dispersed seed	moist, to wet fertile areas
Scotch thistle (Figure 9)	biennial	wind or water dispersed seed	well drained hillsides, moist, to wet fertile areas, roadsides

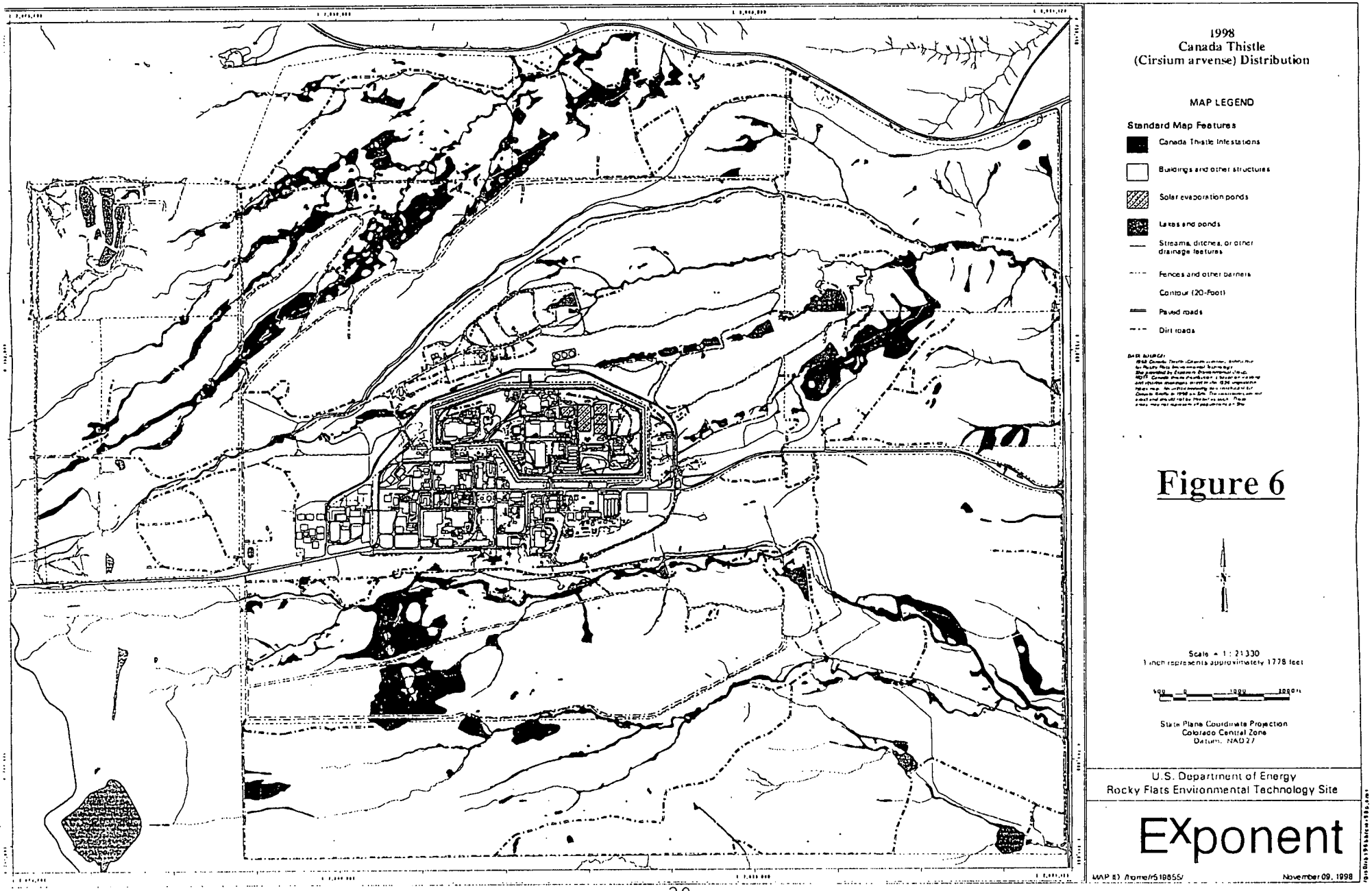
Weed Controls

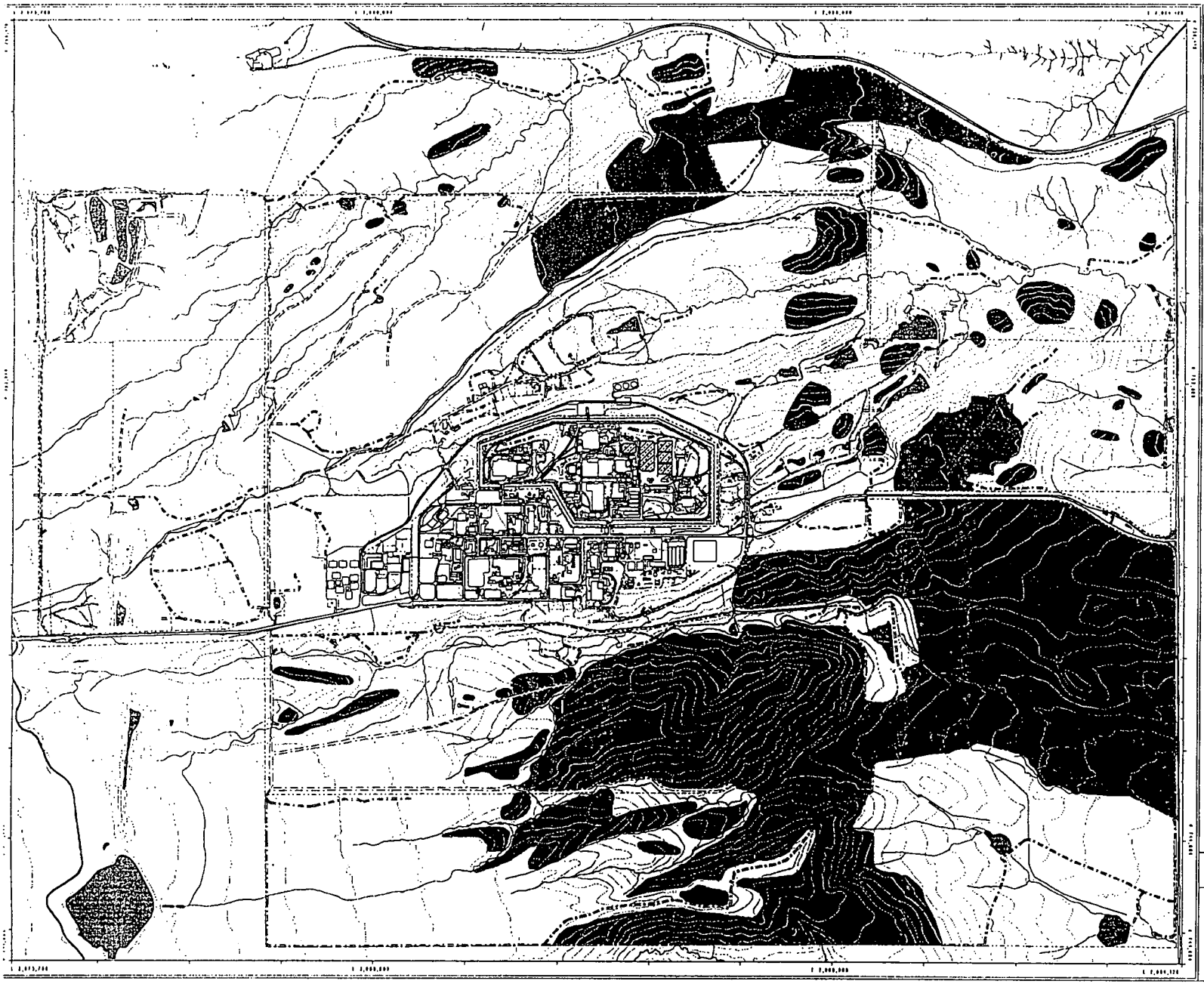
Table W-3 shows the suite of controls known to be effective against each of the Priority 1 weeds either at the Site or in the State of Colorado. Experts from the Colorado State University Extension Service recommend that a combination or a sequence of control techniques be used together to have the greatest effect against any of these weeds. For example, application of herbicides might be followed by overseeding the treated area with desirable species in order to increase the number of desirable plants and provide more competition for the weeds. Since eradication of weed species is very difficult, the Extension Service advises that controls will likely need to be repeated periodically in order to control the spread of weeds that can recur from widespread root systems or seeds that are lying dormant in the soil. Not all of the listed methods are equally effective, and a combined approach gives the best chance for effective control of a given weed species.

The effectiveness of vegetation management treatments are evaluated using test plots established in the buffer zone. Where broadcast herbicide application is made, control plots are left untreated so they can be compared to untreated plots. This method uses counts of weeds per square meter as a quantitative evaluation method for treatment effectiveness. A similar methodology is used when evaluating the results of a controlled burn, except that desirable plants are also included in the counted species.

The weed mapping effort is a secondary method used to evaluate weed treatment effectiveness and to document the extent of weed infestations. This qualitative method maps the different species on the basis of high, medium, and low densities as observed from some distance from the infestations during the flowering. The observer sketches the area and extent of the infestation, as well as the approximate densities.

When small populations of weeds are removed manually or treated individually, the site is revisited to see if new plants are evident, and new plants are retreated upon that visit.





1998
Musk Thistle
(Carduus nutans) Distribution

MAP LEGEND

Standard Map Features

- Musk Thistle infestations
- Buildings and other structures
- Solar evaporation ponds
- Lakes and ponds
- Streams, ditches, or other drainage features
- Fences and other barriers
- Contour (20-Foot)
- Paved roads
- Dirt roads

Figure 7

Scale = 1 : 21330
1 inch represents approximately 1778 feet

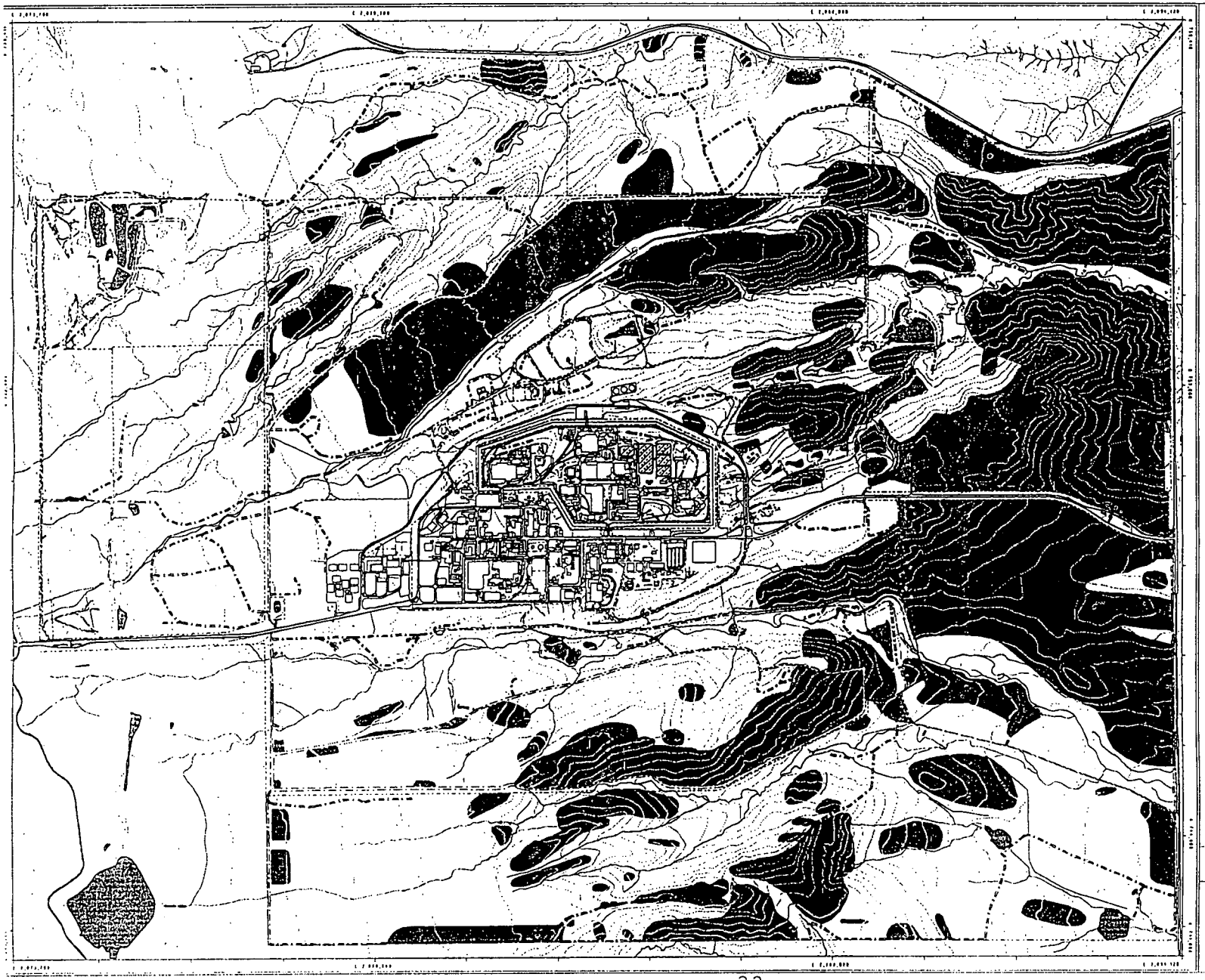
600 0 1000 2000 ft

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

EXponent

MAP ID: /home/r519655/ November 09, 1998



1998
Dalmatian Toadflax
(Linaria dalmatica) Distribution

MAP LEGEND

Standard Map Features

- Dalmatian toadflax infestations
- Buildings and other structures
- Solar evaporation ponds
- Lakes and ponds
- Streams, ditches, or other drainage features
- Fences and other barriers
- Contour (20-Foot)
- Paved roads
- Dirt roads

Data Sources:

Figure 8

Scale = 1 : 21330
1 inch represents approximately 1778 feet

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

EXponent

MAP ID: /home/rf19655/

November 09, 1998

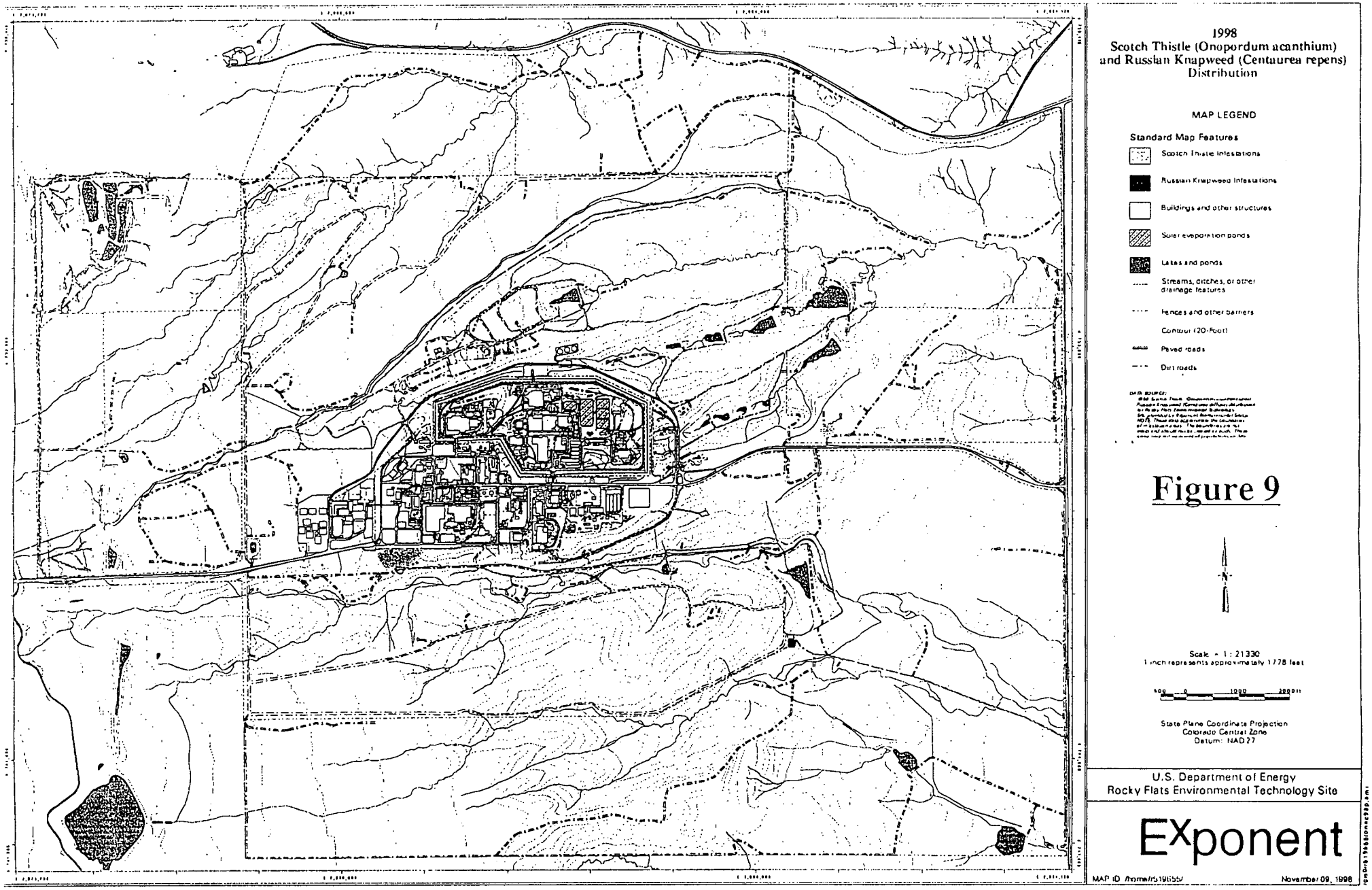


Figure 9

Table W-3
Controls for Priority 1 Weed Invaders at Rocky Flats

Weed Name	Cultural Control	Mechanical Control	Chemical Control	Biological Control
Diffuse knapweed	competition from grasses irrigation overseeding	mowing	Banvel Tordon 22K Transline Banvel 2,4-D mixes of these chemicals	seed head flies root borer beetles
Russian knapweed	competition from forbs and grasses	mowing	Tordon 22K Tordon plus 2,4-D Telar Escort	seed head flies moth fungi livestock grazing
musk thistle	competition from healthy rangeland	digging or soil tillage	Tordon 22K Banvel Banvel plus 2,4-D Telar Transline Ally-Escort	musk thistle seed head weevil foliage weevil root borer
Dalmatian toadflax	competition from forbs and grasses	pulling	Banvel	weevils moths
Canada thistle	competition from forbs and grasses	mowing burning	Tordon 22K Banvel Telar Transline Escort	weevils stem and shoot gall fly livestock grazing
Scotch thistle	competition from forbs and grasses	pulling, digging	Escort Telar	weevils

Herbicide Use

Application of herbicides has been the weed control technique most utilized at Rocky Flats. Figure 10 is a map of the potential areas in the buffer zone where herbicides would be used. Table W-4 lists the herbicides that have been used at Rocky Flats within the past five years and the weeds they have been applied to. All of these herbicides have undergone testing by the Environmental Protection Agency to determine the safe application rates for each chemical and the protective equipment recommended for personnel applying them. All herbicide applications at the Site follow the manufacturer's instructions listed on the herbicide label which implement the requirements of the Federal Insecticide, Fungicide and Rodenticide Act. Rocky Flats may elect to use new herbicides that gain Environmental Protection Agency approval and become available in the future if it appears they would be effective against weeds at the Site.

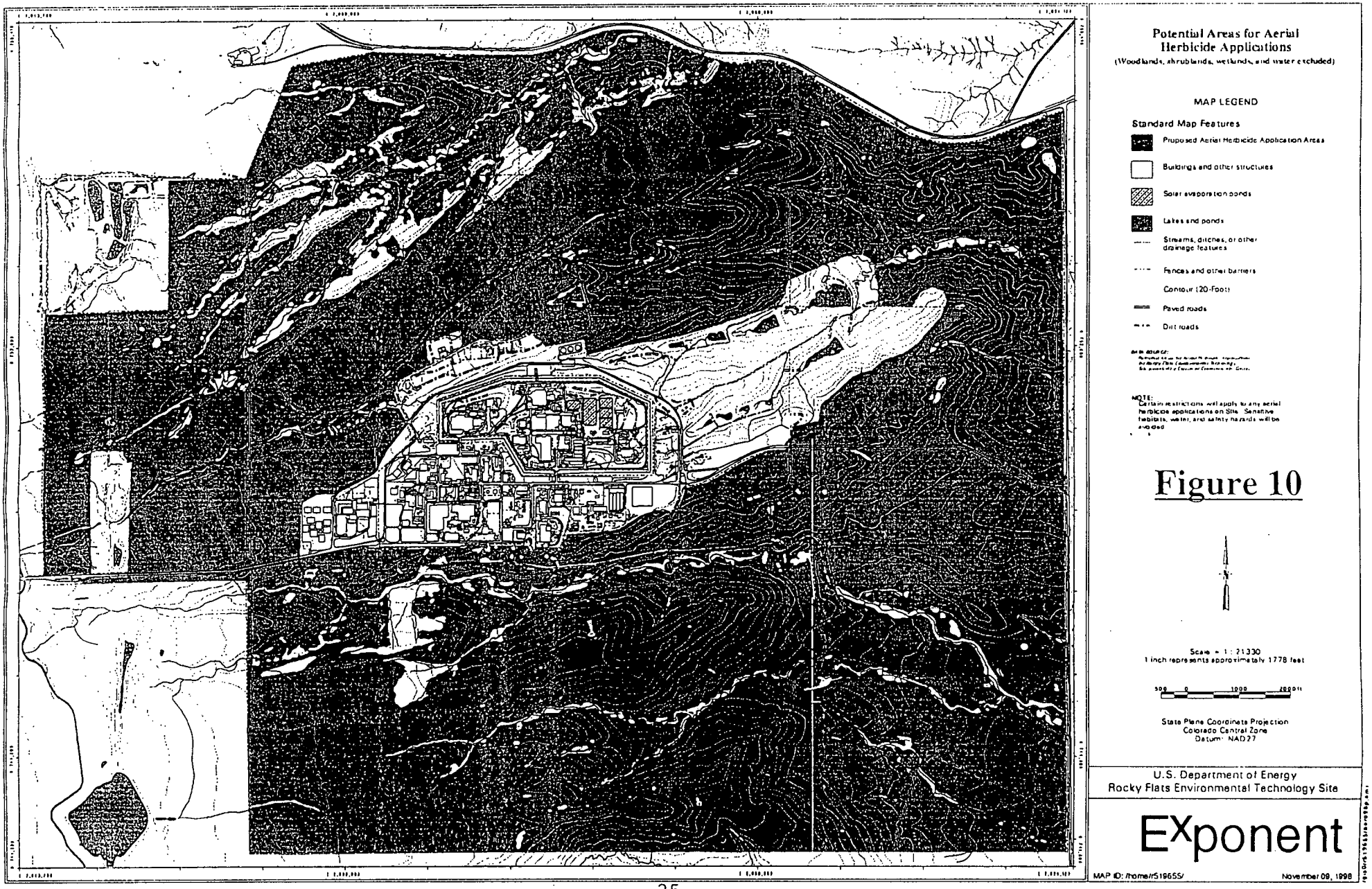


Table W-4
Herbicides Used At the Site

Herbicide (Active Ingredient)	Species Controlled	Uses
Transline (Clopyralid)	Diffuse knapweed, Russian knapweed, musk thistle, Canada thistle oxeye daisy, bull thistle, burdock, wild (prickly) lettuce, teasel.	Used to selectively control undesirable species in the Buffer Zone.
Tordon 22K (Picloram)	Diffuse knapweed, Russian knapweed, oxeye daisy, clover, leafy spurge, field bindweed, Canada thistle.	Used to selectively control undesirable species in the Buffer Zone.
Plateau (Imazapic)	Crabgrass, leafy spurge, cheatgrass.	Recommended for maintenance of turf grass and restoration of native prairie grass. Used around ornamentals and other areas in the Industrial Area.
Karmex (Diuron)	Kochia, wild (prickly) lettuce, field bindweed, annual rye grass, (green) foxtail.	Used for specific target species in selected areas (e.g., PIDAS and roads).
Roundup (Glyphosate)	Roundup is a non-selective, systemic weed & grass killer at various rates of application it will control grasses broadleaf plants, vines, and brush species.	Used for specific target species in selected areas (e.g., PIDAS and roads, or spot treatment of Scotch thistle).
Arsenal (Imazpyr)	At various rates of application will control grasses broadleaf plants, vines, and brush species.	Used for growth suppression or complete vegetation control in areas where bare ground is required.
Banvel (Dicamba)	Sweetclover, kochia, wild (prickly) lettuce, wild mustard (includes flixweed), burdock, diffuse knapweed, puncturevine, Russian thistle, teasel, bull thistle, musk thistle, field bindweed, Russian knapweed, Dalmatian toadflax.	Used for specific target species in selected areas (e.g., PIDAS and roads).
Escort (Methsulfuron Methyl)	Blue mustard, chicory, common mullien, flixweed, gumweed, redstem filaree, sweet clover, wild (prickly) lettuce, Canada thistle, hoary cress, teasel, bull thistle, field bindweed, Scotch thistle, musk thistle.	Used for selective broad-spectrum weed control, or at higher dosages for growth suppression and/or complete vegetation control in areas where bare ground is required (e.g., around transformers or in PIDAS).
Oust (Sulfometuron Methyl)	Crabgrass, yellow sweet clover, foxtail, downy brome, and many other species.	Used as a pre-emergent and post-emergent control agent for many grasses and broadleaf plants in industrial areas
Surflan (Oryzaline)	Downy brome, foxtail, puncturevine, redstem filaree, wild (prickly) lettuce,	Used for specific target species in selected areas (e.g., PIDAS and roads).
Telar (Chlorsulfuron)	Blue mustard, flixweed, wild mustard, bouncingbet, Canada thistle, musk thistle, sweet clover, hoary cress, annual rye grass, bull thistle, common mullien, teasel, foxtail, puncturevine, Scotch thistle.	Used for specific target species in selected areas (e.g., PIDAS and roads).

Before Tordon 22K or any other herbicide is approved for use at Rocky Flats, ecologists and water quality specialists evaluate the compounds for efficacy and environmental risk. Any new herbicide that is considered for use is subjected to this process. The risks associated with some herbicides evaluated have been considered too high to allow their use at Rocky Flats.

There are specific parameters for weather conditions suitable for herbicide application. The manufacturer's label states specific limitations for application, and DOE will require that any applicator follow these limitations. Each herbicide has a certain time before it binds to soil and vegetation so it can not be transported by rainfall runoff, therefore there are restrictions on application to ensure that application will not occur within a certain time before precipitation is expected. According to label instructions, if inclement weather threatens, the herbicide will not be applied, and spray application is suspended when wind speeds reach specified maximums. Other restrictions may apply depending on the label instructions for any given herbicide. Full compliance with licensing restrictions for herbicides is required of any herbicide applicator at Rocky Flats.

Herbicides have been applied at Rocky Flats using both truck mounted spray apparatus and backpack spray systems. The acreage of weeds that can be treated using truck mounted equipment and backpack equipment has been limited by the ability to get the equipment and personnel into areas of weed infestations in areas of steep terrain or areas located at a distance from roads. Approximately 230 to 250 acres of land infested with weeds have been treated with herbicides in each of the last 4 years.

Aerial application of herbicides has been used on adjacent properties and even a small area of Rocky Flats property in recent years. The acreage being mined by Western Aggregates west of the Site and on part of the buffer zone, and the National Wind Center property northwest of the Site, have been sprayed using a helicopter in the past two years. Boulder County Open Space has also used aerial spraying on properties north of the Site. Aerial herbicide application typically utilizes helicopters or small fixed wing aircraft. The most likely aircraft to be used at Rocky Flats is a helicopter. Herbicide is sprayed from approximately ten feet above the surface of the ground. An avoidance zone is established around waterways (streams, ponds, seeps and springs) where herbicides are not applied to prevent the introduction of herbicides to the vegetation and water in these areas.

Aerial sprayers and truck mounted sprayers in the buffer zone would be restricted to weed infested areas that lie at least 30 feet from open water. Application by hand held sprayers or wick applicators could be conducted closer to water without increasing the likelihood of contaminating surface water. Spraying would occur in the early spring or late fall.

Chemical controls (herbicide applications) are the most effective broad area treatment. The cost per acre for this treatment is much lower than labor intensive methods, and different compounds can be used to target specific weed groups. When applied at recommended application rates and at optimum times, these compounds can provide effective multi-year control. Over an extended period, use of these herbicides can effectively reduce the populations of the undesirable plants, and when used properly even stimulate growth of desirable native plants. While these compounds can affect non-target native plants, most of the desirable plants in the prairie ecosystem are perennials with sufficient internal reserves to recover from injury by these herbicides. Ultimately native plants benefit from the removal of the alien competition.

Controlled Burns

Historical documentation indicates that the grasslands extending from the Great Plains up to the foothills in Colorado have been subjected to rangeland fires caused by lightning or purposely set by Native Americans for thousands of years. Range management theory is based upon the belief that the grasses and other plants native to the plains evolved in conditions that included periodic removal of old vegetation by fire. Therefore, rather than being a detriment to the survival of native grasses and forbs, range fires actually promote native vegetative growth.

Encouraging an abundance of native species produces a community that provides diverse habitat for wildlife at the Site. Diverse native communities are better able to compete with weedy invaders. In thick, healthy grassland communities, weed seeds may not be able to get a foothold because the well established native species shade weed seedlings and use most of the available water. Grasslands with widely spaced or weakened native plants leave plenty of room for invaders to take hold.

Controlled burns can be used to supplement other weed control techniques, but burning is considered to be a tool for stimulation of native vegetation growth rather than a primary a weed control activity. While burning does not directly control most weeds, it does release nutrients that are tied up in dead plant material, making them available for use by the established plants. The removal of the dense plant litter and the boost of nutrients normally improves the health of the prairie communities and increases the vigor of the fire-adapted natives. Burning in weed infested areas (such as diffuse knapweed infestations) can stimulate germination of new weed seedlings, so follow up treatments with herbicide or hand pulling may be necessary.

Controlled burns for vegetation management have not been conducted at Rocky Flats since the Site was constructed. Two lightning caused wildfires in March 1994, and September 1996, burned approximately 70 and 103 acres in the north and southwest sectors of the buffer zone, respectively. These fires were suppressed by Site personnel with the help of fire companies from surrounding communities under established cooperative agreements.

Conducting a controlled burn requires a combination of field preparation and favorable weather conditions. A specific burn prescription would be prepared each year for identified burn areas and submitted to Jefferson County as part of an application for a burn permit. The prescription is a list of specific conditions for the planned burn. The prescription would include specific target areas, acceptable wind speeds and wind directions, required humidity, required weather prediction, and other factors necessary for a successful controlled burn. All of the conditions of the prescription would have to be met before a burn would be conducted. This could mean that no prescribed burn would occur any given year if conditions were outside the prescription during the approved time window. Rocky Flats would require the expertise and assistance of cooperating agencies such at the Colorado State Forest Service, local fire companies, and neighboring city and county land management departments in planning and conducting controlled burns.

Some prerequisites for conducting a controlled burn at Rocky Flats include:

- Jefferson County burn permit
- approved burn prescription
- appropriate fire equipment for wildfires
- sufficient qualified personnel
- air monitors

- defined burn area boundaries
- favorable wind direction
- favorable wind speeds
- favorable relative humidity, (normally 20% or less)
- plan for notification of public and private neighbors
- contingency plan

Controlled burns are generally conducted when grasses and forbs are dormant so that dead plant material (plant litter) is removed with minimal damage to the next year's growth. At Rocky Flats this condition limits the available time frame for controlled burns to early spring or late fall. Spring burns are normally conducted at or before the start of plant growth, often only a week or two before vegetation re-emerges. Fall burns in September and October are conducted after the majority of the native vegetation has completed its growth cycle and set seed for the season. Soon after a burn, spring rains or winter snow melt will help nutrients from ash return to the soil for reuse by plants.

The most important weather factors to consider are humidity and wind velocity. The amount of humidity affects how successfully fuels will burn, and how hot fires become. An extremely hot fire is undesirable due to the greater damage it can cause to dormant plant crowns. Low wind velocity is important in predicting the behavior of a grassland fire and maintaining control of the movement of the fire once it is ignited.

The vegetation areas suitable for controlled burning at Rocky Flats are shown on Figure 11, Potential Controlled Burn Areas. The Great Plains riparian and tall upland shrubland communities are not shown as part of the potential burn area. Burning in these communities may be conducted on a case by case basis. Small plots within these communities might be burned in the future and then monitored to evaluate of the effects of burning. Fire breaks may be burned in these communities to control the spread of wildfires. Should fire prove beneficial to these communities, burn planning would follow a similar process of development of prescriptions, definition of target areas, and performance of burning as within the grasslands.

Figure 11, which shows areas with potential for controlled burning exclude areas where burning could interfere with operations, damage facilities, or where elevated soil radiation is known to exist. One area where elevated plutonium and americium have been documented is immediately southeast of the developed portion of the Site. Several studies have been conducted to determine whether plants growing in radioactively contaminated soils absorb radionuclides into their systems. The studies concluded that they do. The data indicate that there is a direct correlation between the level of radionuclides in the soil and the level of radionuclide content in vegetative matter. Radionuclide content of vegetation samples ranged from 0.020 to 28.5 picocuries per gram of the dry weight of the vegetation. It appears that grasses incorporate the highest levels of radioactive elements into their systems, followed by forbs, and to a lesser extent, shrubs.

Other Controls

Other methods of controlling the spread of weeds at the Site include mowing roadsides to hinder weed growth and remove seed heads before the weeds mature; grading dirt or gravel roads to remove weeds growing in the roadway; occasional hand pulling or spot herbicide treatment of small, isolated populations of weeds; and releasing insects that are known to eat weeds or their

seeds. Approximately 25 miles of roadway are maintained each year by grading, and the borrow areas of another 10 miles of roadway are mowed. In recent years, seven species of insects available from the Department of Agriculture have been released at the Site to help control St. Johnswort, Dalmatian toadflax, diffuse knapweed, and thistle species.

The Site has experimented with insects as weed controls since the 1970s. Biological controls that have become well established, and that are effectively controlling weeds at the Site include those specific for musk thistle, Canada thistle, and St. Johnswort. Musk thistle is controlled through introductions of a root borer and a seed-head weevil. The weevils have demonstrably reduced seed production since 1991. The St. Johnswort beetle has also effectively reduced the viability of that plant in some areas on the Site.

More recently a gall-forming fly and two rootboring beetles that attack knapweed, and a caterpillar that feeds on toadflax have been introduced at the Site. Neither beetle specifically seeks diffuse knapweed as a host, but they have been helpful on spotted knapweed in other areas. The caterpillar has had some effect on Dalmatian toadflax.

The Colorado Department of Agriculture has provided the gall fly, beetles, and caterpillar under an the agreement that the Site will be an evaluation location for these biological agents. Since three of these agents usually inhabit other species of the same genera that are not resident at the Site, time will tell if they can effectively stress or reduce the noxious plants onsite.

Given the size of the infestations of the weed species for which biological agents have been introduced, there is no danger of herbicides removing the entire food source from the insects. The best possible result is that herbicides will reduce weed populations to manageable levels and that other methods, including biological controls, can then work to maintain that control.

Biological controls (insects) do not eradicate the targeted weeds, but weaken the plant and generally reduce their viability. Their most beneficial effect is usually a dramatic reduction in viable seed production because the insect larvae eat the weed's seeds. The biological controls that have been introduced at Rocky Flats have been insects that are being tested for effectiveness on the target weed species and tested for benevolence toward non-target natives. None of the insect species completely destroy their host plants.

In general, cultural and mechanical controls can be used to stress or weaken the weeds to make them susceptible to additional control methods applied later. Mechanical controls, such as digging or pulling, can be very effective if they remove the root system, but due to the labor intensity required, they are only useful in small areas.

The Site collects weeds that have blown across the ground and collected against fences and disposes of them as sanitary waste to prevent further dispersal of weed seeds. The Site helps control the spread of weeds into areas disturbed by construction or remediation by immediately replanting these areas with a customized native seed mixture that replicates as closely as possible the plant community in the surrounding area.

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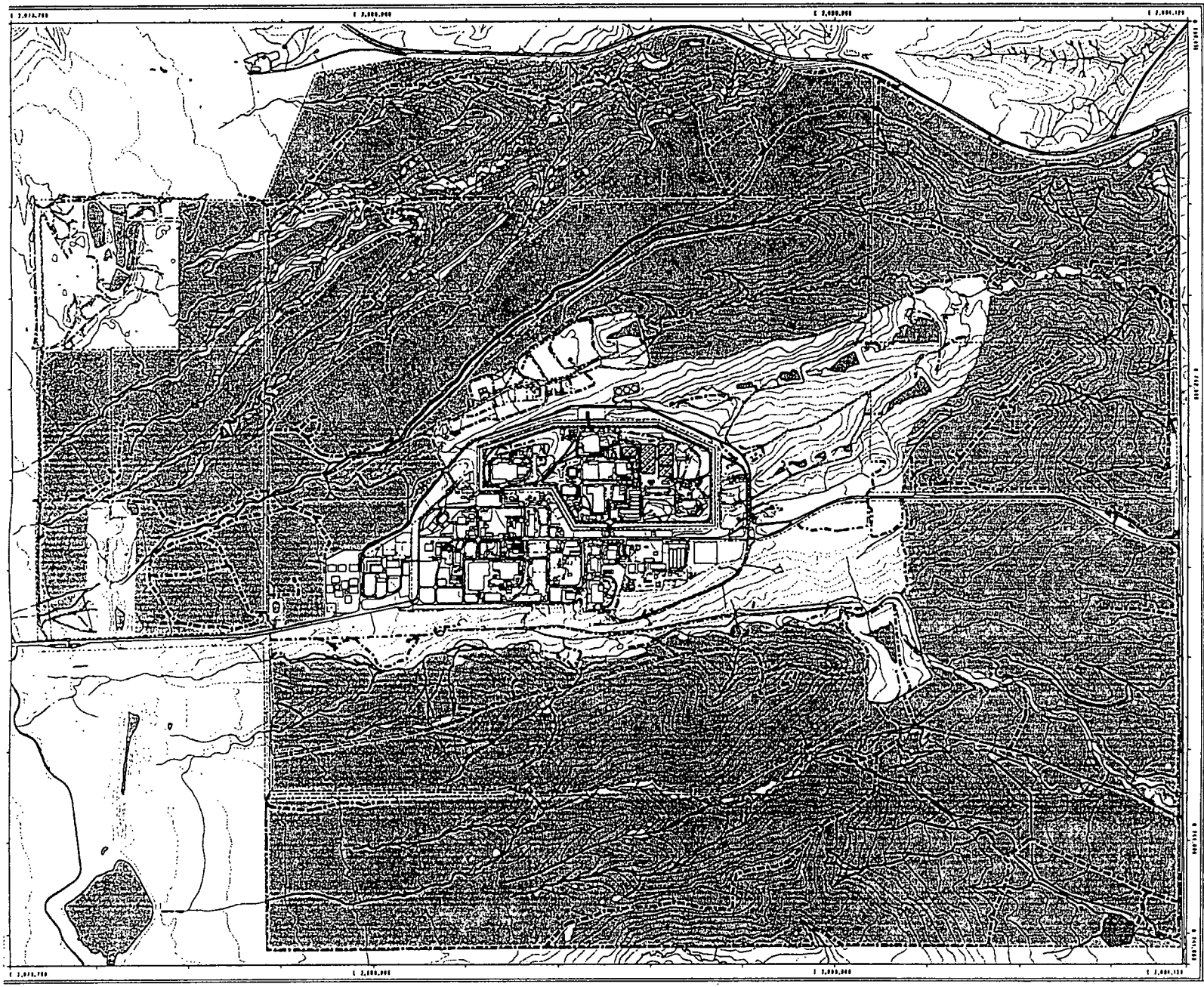


Areas to be Considered For Prescribed Burns - Pending Authorization

(Woodlands and Shrublands Excluded)

MAP LEGEND

Standard Map Features

- Potential Prescribed Burn Areas
- Buildings and other structures
- Solar evaporation ponds
- Lakes and ponds
- Streams, ditches, or other drainage features
- Fences and other barriers
- Contour (20-Foot)
- Paved roads
- Dirt roads

DATA SOURCE:

NOTE:

Figure 11

N

Scale = 1 : 21330
1 inch represents approximately 1778 feet

0 1800 3600 Feet

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

EXponent™

MAP ID: /home/t519655/ April 15, 1999

Soils

Soils at the Site have been sampled and studied as part of the Site's soil monitoring program, the background soil characterization program, and the remedial investigations of various operable units. Soils were also mapped by the U.S. Soil Conservation Service as part of a soil survey of the Golden, Colorado area. Table S-1 summarizes widespread soil types and their properties.

Table S-1. Widespread Soil Types at the Site

Soil Type	Occurrence	Properties	Water/Wind Erosion	Properties Restricting Use[1]
Western Portion of the Site				
Flatirons: Very cobbly to very stony sandy loams. Deep, well-drained.	• Pediments, high terraces, upper hillsides (0-5% slopes) • Predominant soil type in western half of Site, but extends to eastern half	• Permeability: moderate • Runoff: slow • Composition: 35-80% cobbles by volume	• Water erosion: slight • Wind erosion: slight	• Number of cobbles • Expansive clays (shrinking/swelling)

Table S-1. Widespread Soil Types at the Site

Soil Type	Occurrence	Properties	Water/Wind Erosion	Properties Restricting Use[1]
Nederland: Very cobbly, sandy loam. Deep, well-drained, cobbly to gravely and loamy.	• Fans and terrace escarpments (10-15% slopes) • Valley slope soil in western half of the Site	• Permeability: moderate • Runoff: rapid • Composition: 35-75% cobbles by volume	• Water erosion: severe on steep slopes • Wind erosion: slight	• Slope • Large stones
Eastern Portion of the Site[2]				
Denver-Kutch-Midway: Clay loams. Denver-Kutch moderately deep to deep, well-drained. Midway shallower.	• Most notable in eastern half of Site; but also occurs in western half along valley slopes • Denver-Kutch: lower hillsides along drainages (5-25% slopes) • Midway: steeper slopes	• Permeability: low • Runoff: rapid • Composition: 0-15% cobbles by volume	• Water erosion: severe • Wind erosion: low to moderate	• Depth to bedrock • Expansive clays (shrinking/swelling) • Slope • Low strength • Low permeability

Valmont: Clay loam. Deep, well-drained.	• Northeast corner of Site on eastward extension of divide between Rock Creek and Walnut Creek drainages (0-3% slopes)	• Permeability: low in upper 20-40 inches • Runoff: slow • Composition: 0-15% cobbles by volume	• Water erosion: low • Wind erosion: moderate	• Clay content • Expansive clays (shrinking/swellin g) • Low strength
Haverson: Loam.	• Flood plains or low terraces (0-9% slopes)	• Permeability: moderately low • Runoff: medium • Composition: 0-35% cobbles by volume	• Water erosion: moderate • Wind erosion: moderate	• Expansive clays (shrinking/swellin g) • Flooding during brief periods in spring and summer
Nunn: Clay loam.. Deep, well-drained.	• Lower slopes adjacent to drainage bottoms in eastern portion of the Site	• Permeability: low • Runoff: slow to medium • Composition: 0-15% cobbles by volume	• Water erosion: slight to moderate • Wind erosion: slight to moderate	• Expansive clays (shrinking/swellin g) • Low strength • Low permeability

[1] *Refers to properties restricting use of a soil type for construction, revegetation, or waste management purposes.*

[2] *Less-common clay loams along the eastern margin of the Site include soils of the Veldkamp, Englewood, McClave, and Leyden-Primen-Standley associations.*

There is a major difference between the soil characteristics in the western part of the Site and the eastern part. Soil types of the western buffer zone are very cobbly in contrast with the clay loam soil series of the eastern buffer zone. The differences in the soil texture drive major differences in the vegetation types from west to east. The xeric tallgrass prairie vegetation types are found on the pediment tops in the western buffer zone where they grow in coarse, dry soils. Conversely, the mesic vegetation series, dominated by plants that are less drought tolerant, are well suited to the fine clay loam soils characteristic of the East Side of the buffer zone.

Operations at the Site may have introduced contaminants to the soil through waste disposal practices and accidental releases and spills. Surface contaminants have been distributed primarily by the actions of wind, water, and isolated physical disturbance. Because operations at the Site have involved the manufacture and use of a wide range of substances, the types of contamination vary widely. Some of the primary contaminant types include radionuclides, solvents, metals, acids, polychlorinated biphenyls, and fuel hydrocarbons. The contaminants of most concern during vegetation management are radionuclides, which could be disturbed and redistributed as a result of management activities.

Radiological Soil Contamination

Soil contaminants of primary concern at the Site are radionuclides—particularly plutonium, americium, and uranium. Determining what is natural or background and what constitutes radiological contamination has been the subject of many investigations at the Site. Sources of plutonium in the environment can be categorized as "global sources" that have distributed

plutonium around the world and "local sources" that have distributed plutonium on a much smaller spatial scale. Global sources include atmospheric nuclear weapons testing and the burn-up of a satellite in the atmosphere. Local sources include emissions from nuclear material processing facilities and accidental releases.

Soils in some localized areas of the Site have not been completely characterized. In some cases, soil samples have not yet been collected for locations known to have been used for storage or handling of radioactive materials. Nevertheless, enough data exist to present an adequate picture of radiological contamination in soils at the Site under baseline conditions.

Plutonium

Plutonium contamination in surface soil across the Site has been studied since the late 1960s. Although differing in some details, all resulting maps have shown a plume of elevated concentrations of plutonium extending over the eastern portion of the Site, and in several cases, off-site to the east and southeast. Concentrations of plutonium in the soils are highest on the eastern side of the Industrial Area and decrease with distance from this location. The dominant source of this dispersed plutonium is the capped area known as the 903 Pad.

Radiological soil sampling programs were conducted from 1972 to 1978 and from 1983 to 1994. Soil samples were collected from locations situated along two concentric circles, one with a radius of approximately 1 mile and the second with a radius of approximately 2 miles from the center of the Industrial Area. The highest plutonium concentrations were found in soil samples from the eastern portion of the Buffer Zone, with the contamination trending east to southeast and concentrations decreasing with distance from the Industrial Area.

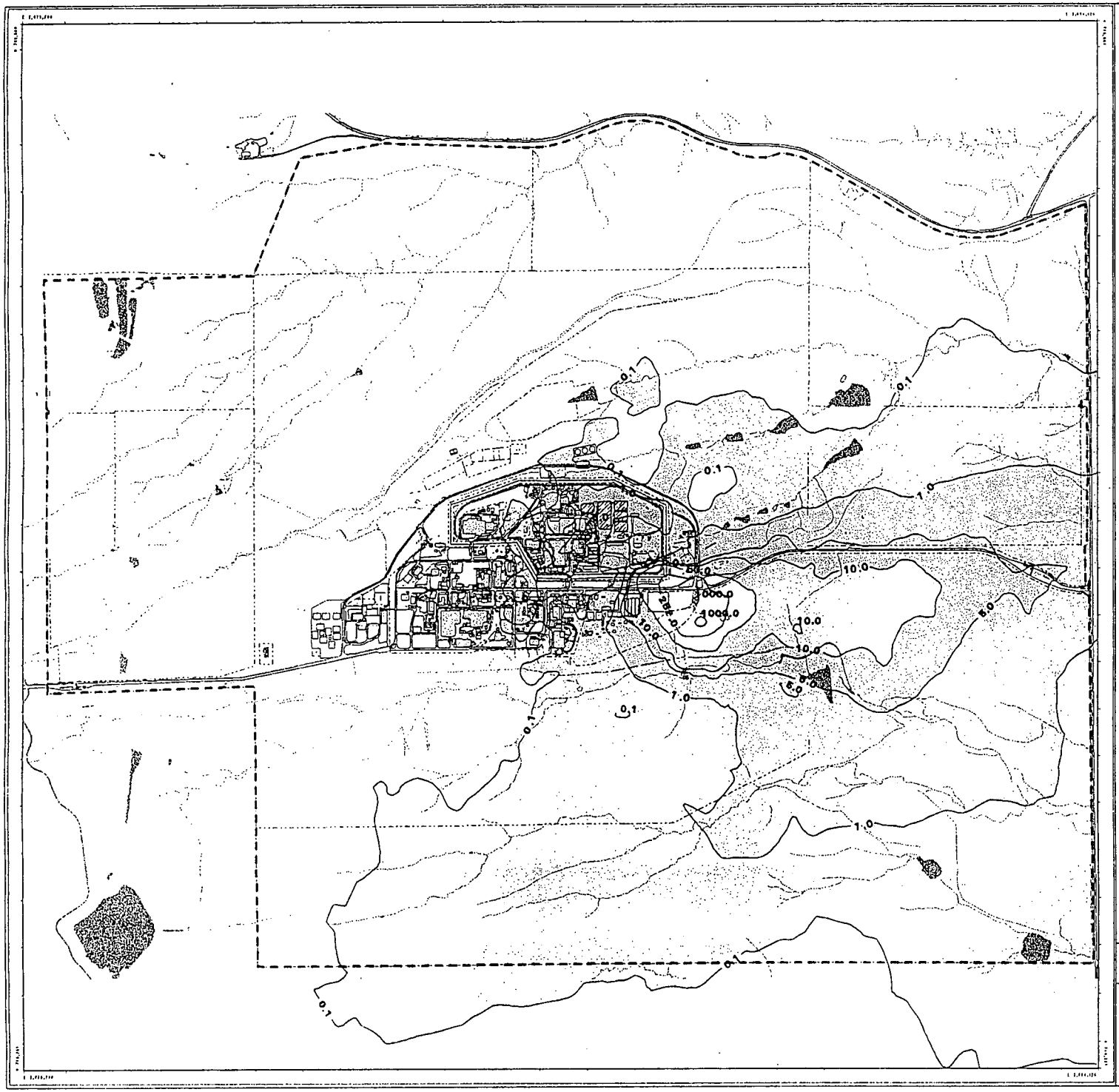
Americium

Americium in soils at the Site has not been studied as intensively as plutonium. Americium is present in soils as a decay product of plutonium, and the spatial distribution of americium-contaminated soil overlaps with that of plutonium-contaminated soils. Nearly all of the americium in the soil around the Site has resulted from radioactive decay of plutonium deposited in the soil. Anomalies in americium distribution may have resulted from spills of americium rich materials from process wastes. Figure 12 is a map showing average americium levels in surface soils at the Site.

Uranium

Uranium is mainly present at the Site as a natural component of rocks and soils, and to a lesser degree as a result of atmospheric fallout and Site emissions. The spatial distribution of uranium is not clearly related to areas at which accidental releases are known to have occurred, and it is not consistent with the wind dispersal mechanism identified for plutonium because uranium isotopes were not included in the 903 Pad environmental releases. The greater mobility of uranium has been proposed as an explanation for the irregular spatial distribution of uranium. Uranium is commonly transported in a dissolved form in surface water runoff from rainfall and snowmelt, whereas plutonium is relatively insoluble and adheres very strongly to soil particles.

In most Site soils, quantities of uranium fall within the background range. The average background level for uranium isotopes is 1.097 pCi/g for uranium-233/-234, 0.0539 pCi/g for



Am-241 Isoplot (pCi/g)
(1998 Kriging Analysis)

EXPLANATION

Standard Map Features

- Buildings and other structures
- Solar evaporation ponds
- Lakes and ponds
- Streams, ditches, or other drainage features
- Fences and other barriers
- Rocky Flats boundary
- Paved roads

DATA SOURCE:
Buildings, fences, hydrography, roads and other structures from 1994 aerial fly-over data captured by EG&G RSI, Las Vegas.
Digitized from the orthophotographs 1:24

Figure 12

Americium Levels In Soils

Scale = 1 : 32250
1 inch represents approximately 2688 feet

600 0 1000 2000ft

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

Prepared by:
RMRS Rocky Mountain Remediation Services, L.L.C.
Geographic Information Systems Group
Rocky Flats Environmental Technology Site
P.O. Box 464
Golden, CO 80402-0464

MAP ID: 98-0274-AmCntr November 12, 1998

/gis2/projects/fy98/98-0274/cntr-map/krig-cntr.aml

recording flow meters and automatic water samplers that are programmed to sample storm event and pond discharge event flows.

Air Quality

National Ambient Air Quality Standards have been established to protect public health and the environment for six "criteria" pollutants: carbon monoxide, sulfur dioxide, nitrogen dioxide, ozone, particulate matter less than 10 microns in size (PM-10), and lead. Total suspended particulate (TSP) matter is also designated as a criteria pollutant by the State of Colorado. This analysis is primarily concerned with the PM-10 and TSP emissions from the Site since they are the pollutants likely to be generated by vegetation management actions.

The Site is located within the boundary of the Denver Metropolitan Area for air quality planning purposes. This region is classified as "non-attainment" for carbon monoxide, ozone, and PM-10, which means that ambient air quality in the area does not meet National Ambient Air Quality Standards. Regulatory requirements may control the timing of vegetation management activities, such as issuance of permits for controlled burning, in order to avoid contributing to the non-attainment of the Metro area for criteria air pollutants and violating the Site's air quality permit.

Air monitoring programs have been implemented at the Site since the early 1950s. Emissions of criteria air pollutants are estimated and reported as part of the Site's compliance with applicable state and federal reporting and permitting requirements. CDPHE conducts ambient air quality monitoring at the Site boundary and in communities surrounding the Site as part of its state-wide ambient air quality monitoring network. The locations of the on-site and boundary air monitoring stations are shown on Figure 1.

Activities at the Site involve the use of internal combustion equipment, such as steam boilers and emergency power generators, and many types of chemical compounds that could release air pollutants to the atmosphere. Residents of the Denver Metropolitan Area are exposed to small quantities of these pollutants through off-site transport. In this section, the concentrations of pollutants to which workers on-site and individuals off-site are exposed are summarized and compared to federal and state standards or guidelines designed to protect human health. Ozone, one of the criteria pollutants, is not specifically addressed in this analysis because it is formed in the atmosphere far downwind of emission sources and is usually analyzed on a regional basis.

Concentrations of TSP and PM-10 are determined by five air monitoring stations at the Site property boundary operated by the Colorado Department of Public Health & Environment. These stations monitor for TSP and PM10 as well as other criteria pollutants. Two of these stations are located just off-site at the northeast and southeast Site boundary along Indiana Street. These samplers are operated for 24 hour periods on a rotating, every-sixth-day schedule to match the national EPA particulate sampling schedule. These sampling locations are downwind of the Site and are thus representative of Site impacts. Maximum concentrations of PM-10 and TSP recorded at the CDPHE stations are considered as the ambient off-site concentrations of these two criteria pollutants. As shown in Table AQ-1, all criteria air pollutants are emitted in quantities less than the State of Colorado reporting thresholds under baseline conditions.

Table AQ-1 Highest Predicted Off-Site
Concentrations of Criteria Pollutants for Baseline Conditions

Pollutant	Average Time	Site Concentration ($\mu g/m^3$)	Total Concentration ($\mu g/m^3$)	NAAQS ($\mu g/m^3$)1	State Ambient Standards ($\mu g/m^3$)2	% of NAAQS	% of State Standard
Carbon Monoxide	1-hour	1159.2	14,873	40,000	–	37	–
	8-hour	303.8	4,301	10,000	–	43	–
Lead[3]	Monthly	4.8×10^{-14}	4.8×10^{-14}	1.5	1.5	< 1	< 1
Nitrogen Dioxide[4]	Annual	1.4	21.2	100	–	21	–
PM-10[5]	24-hour	–	32.0	150	–	21	–
	Annual	–	14.0	50	–	28	–
Sulfur Dioxide	3-hour	269.5	448.0	1,300	700	34	64
	24-hour	91.2	137.3	365	–	38	–
	Annual	0.1	10.8	80	–	14	–
TSP[5]	24-hour	–	73.0	–	260	–	28
	Annual	–	31.0	–	75	–	41

[1] *NAAQS are National Ambient Air Quality Standards.*

[2] *State ambient standards are Colorado State Ambient Air Quality Standards.*

[5] *PM-10 and TSP concentrations were obtained from CDPHE's nearby ambient PM-10 and TSP monitors located along the eastern boundary of the Site.*

Weather Conditions

Mean annual precipitation at Rocky Flats is approximately 15.5 inches, based on 20-year means for Boulder and Lakewood, Colorado. The wettest season is spring (March through May), which accounts for about 40% of the total annual precipitation. This season typically includes occasionally heavy snows as well as periods of steady rain. Precipitation gradually declines through the summer, fall and winter.

Northwesterly wind directions and wind speeds under 15 miles per hour are the predominant wind conditions at the Site. Daytime heating causes upslope winds to form, with northeasterly winds common over the broad South Platte River Valley, including the Site. More localized southeasterly winds also occasionally occur during the day at the Site because the terrain slope-

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line is oriented southeast toward Standley Lake and the City of Arvada. The winds reverse at night, with a shallow, westerly drainage wind forming over the Site and a broad, southerly drainage wind forming over the South Platte Valley. The locally produced winds are important to consider for estimating the transport and dispersion of potential pollutants in the region.
The Site is noted for its strong winds. Gusty winds frequently occur with thunderstorms and the passage of weather fronts. The highest wind speeds occur during the winter as westerly windstorms known as chinooks. The windstorm season at the Site extends from late November into April; the height of the season usually occurs in January. Windstorms at the Site typically last 8 to 16 hours. The Site experiences wind speeds exceeding 75 miles per hour in almost every season; gusts exceeding 100 miles per hour are experienced every three to four years.

Wildlife

The Site Buffer Zone is an island of relatively undisturbed habitat within a region where most other land has been heavily grazed, cultivated, developed, or subjected to other impacts associated with intensive human activity. The most notable effects of the increase in human use and disturbance in the Front Range Urban Corridor have been reductions in the number and diversity of ungulates (hoofed animals) and large predators. However, the habitat diversity of the Site, coupled with protection from grazing and human disturbance across most of the Site, have resulted in relatively rich and intact animal communities. Species that typify the various groups of terrestrial vertebrates and invertebrates at the Site are described below.

Mammals

The most abundant and conspicuous large mammal at the Site is the mule deer. This large, wide-ranging species occurs throughout the Site but is most frequently observed in the three stream valleys, where the presence of shade and cover, abundant browse, and water provide good habitat. The population of mule deer is estimated at more than 100. A small number of white-tailed deer have also been observed on-site.

The coyote is the most common and widespread mammalian predator at the Site. Other carnivores documented on-site include the red fox, gray fox, badger, long-tailed weasel, mink, raccoon, and striped skunk.

Results of live-trapping programs over the past two decades indicate that the Site supports a relatively rich small mammal fauna. The most widespread small mammal on-site is the deer mouse, which has been captured in nearly every habitat type. Other common rodents include a number of mouse, vole, and rabbit species, all of which occur in grassland communities across much of the Site.

The Preble's meadow jumping mouse was listed as threatened under the Endangered Species Act on May 13, 1998. Figure 13, Preble's Meadow Jumping Mouse Areas of Concern, is a map of the mouse habitat on-site. The mouse has been captured in all three of the Site's major drainage basins during live-trapping programs in 1992 through 1998. Preble's habitat generally coincides with the Great Plains riparian vegetative community type at the Site. Typical habitat for this mouse consists of riparian areas with well developed shrub canopies and a relatively lush understory of grasses and forbs. However, the mouse is thought to wander seasonally, and its home range may also encompass relatively extensive grassland communities adjacent to riparian

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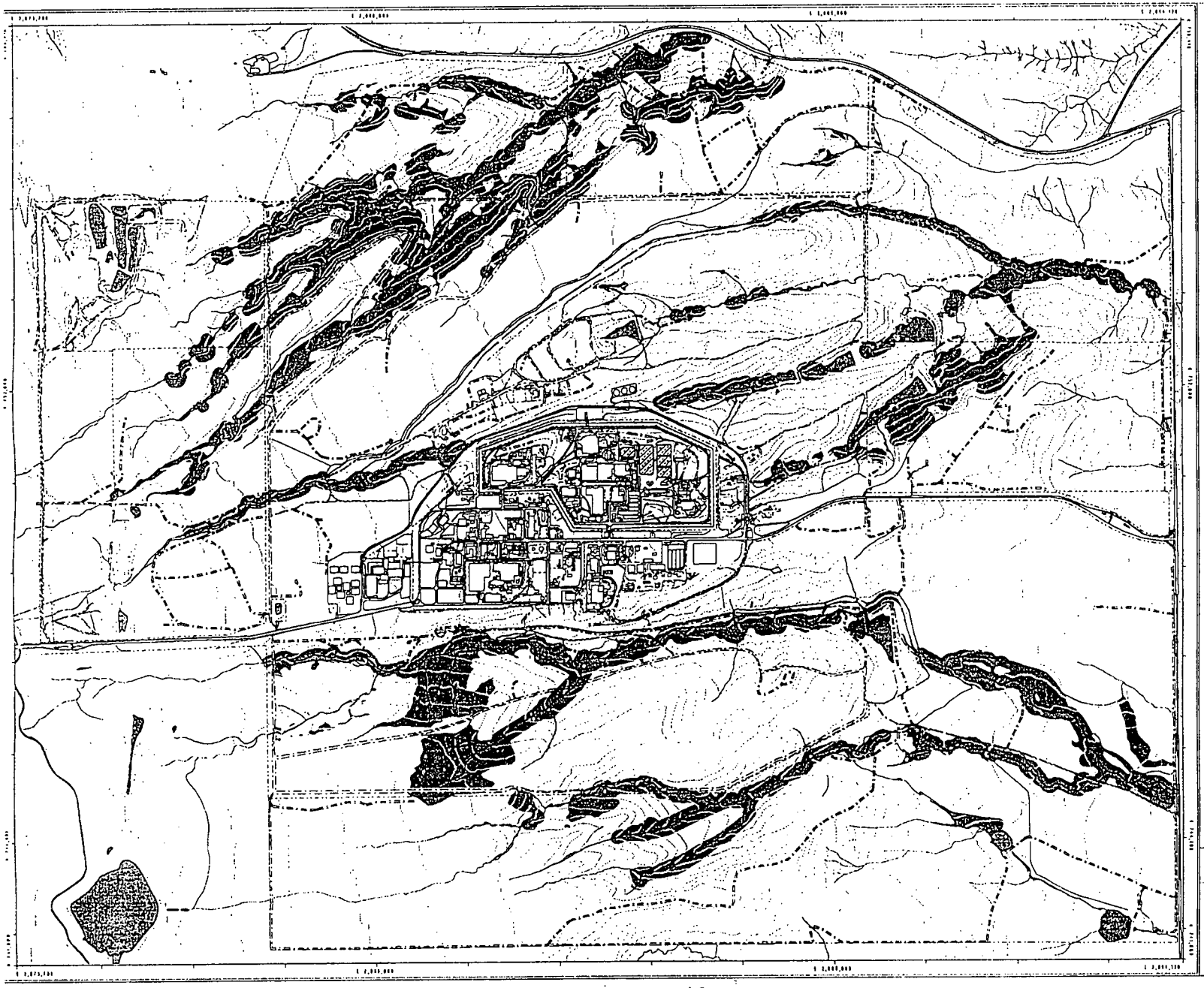

Preble's Meadow Jumping Mouse
Areas of Concern

MAP LEGEND

Standard Map Features

- Areas of Concern
- Buildings and other structures
- Solar evaporation ponds
- Lakes and ponds
- Streams, ditches, or other drainage features
- Fences and other barriers
- Contour (20-Foot)
- Paved roads
- Dirt roads

DISCLAIMER:
This map is not a designation of Preble's Meadow Jumping Mouse habitat at RFETS.

Figure 13

Scale = 1 : 21330
1 inch represents approximately 1778 feet

500 0 1000 2000 ft

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

EXponent

MAP ID: /home/r519655/ November 09, 1998

habitat. A biological assessment of vegetation management activities not currently practiced would be conducted to insure that no adverse effects would result before the activities were implemented.

Birds

The variety of habitats at the Site is reflected by a rich bird community, including species typical of plains, foothills, wetland, and riparian habitats. The most common birds of prey are the red-tailed hawk and great horned owl, both of which are present throughout the year and nest in mature cottonwoods or pines. Less abundant raptors are attracted by the mosaic of trees for nesting and open habitats for hunting, including the American kestrel, Swainson's hawk, and long-eared owl. The rough-legged hawk is common during winter.

Ponds constructed for control of surface water runoff, and for agricultural purposes, support seasonal use by a number of wading birds, shorebirds, waterfowl, and related species. The largest water bird observed at the Site is the great blue heron, which preys on fish, amphibians, and macroinvertebrates. The smaller black-crowned night-heron also feeds along the ponds, although less commonly.

The most common small birds in grassland habitats are ground-nesting species typical of prairie ecosystems in the region. These species include the horned lark, western meadowlark, vesper sparrow, and grasshopper sparrow. Riparian shrublands and tall marshes support wetland songbirds such as the red-winged blackbird, yellow-headed blackbird, common yellowthroat, and song sparrow. Riparian woodlands attract tree-nesting species such as the northern flicker, eastern and western kingbirds, black-billed magpie, blue jay, American robin, yellow warbler, northern oriole, blue grosbeak, indigo bunting, and American and lesser goldfinches. Tall upland shrublands in the Rock Creek drainage attract foothills species such as the yellow-breasted chat, MacGillivray's warbler, black-headed grosbeak, lazuli bunting, and rufous-sided and green-tailed towhees.

Typical winter birds at the Site include resident species such as the northern flicker, black-billed magpie, European starling, house finch, and house sparrow. Winter birds also include the tree sparrow, white-crowned sparrow, and dark-eyed junco, all in wooded or shrubby sites, as well as large flocks of horned larks and, less abundantly, western meadowlarks.

Reptiles and Amphibians

As is typical for the region, reptiles and amphibians are not well represented at the Site. The most common reptiles are the bullsnake, yellow-bellied racer, garter snake, and prairie rattlesnake. All of these species occur in the open grassland habitats that dominate the Site, although garter snakes are frequently observed near (or in) water. Other reptiles observed include the short-horned lizard in open grasslands, eastern fence lizard in rocky shrublands, and western painted turtle in ponds.

By far the most abundant and widespread amphibian at the Site is the boreal chorus frog, which breeds on-site in virtually every stream, pond, ditch, or other area where surface water persists through the spring and early summer. The northern leopard frog is less common and requires permanent water such as some of the ponds provide. Woodhouse's toad breeds in ponds and streams at the Site but may wander considerable distances from water in search of insect prey. The plains spadefoot requires the least persistent water of any of the amphibians at the Site.

Another amphibian that occurs at the Site is the tiger salamander whose aquatic larvae have been documented in several of the ponds on-site. During late summer, the yellow and olive adults may move considerable distances across land, taking shelter in animal burrows during the day to avoid desiccation.

Terrestrial Invertebrates

Four classes of arthropods—millipedes, pill bugs, spiders, and insects—have been captured during sweep-netting and pitfall-trapping surveys in conjunction with ecological evaluations at the Site. Of these, insects are the most abundant and taxonomically diverse group. Terrestrial insects captured during Site surveys have included representatives of ten major families. In general, leafhoppers (a plant-eating group) were the most abundant insects. Other groups of plant-eaters included treehoppers, spittle bugs, seed bugs, leaf bugs, leaf beetles, grasshoppers, and crickets. The other two groups captured were ladybird beetles (which feed on smaller insects) and ants (which consume both plant and animal matter). Common insects such as butterflies, moths, bees, and wasps are also present on-site but have not been specifically documented during ecological investigations. Although not as diverse as the insects, spiders are the second most abundant group overall in terms of number of captures during Site investigations. Millipedes and pill bugs were captured in smaller numbers during the studies.

Invertebrates provide an important prey base for many species of reptiles, birds, and small mammals. Grasshoppers are probably the most important invertebrates in the terrestrial food web because of their abundance, large size, and tendency to occur on the foliage of plants where they are easily detected and captured.

Aquatic Macroinvertebrates

Across most of the Site, aquatic macroinvertebrate communities in streams and ditches are limited by low and irregular flows, except for a few isolated pools, and by predominantly fine-textured sediments. The most abundant and widespread groups overall in stream communities are the larvae of true flies and mayflies. The most common true flies are blackflies and midges. Other aquatic invertebrates include caddisflies, craneflies, predatory damselfly larvae, and two non-insect groups: snails and amphipods (sideswimmers).

Pond habitats provide a more reliable water source, but the fine sediments and relative lack of aquatic plants in many ponds limit macroinvertebrate diversity. Most of the communities are strongly dominated by midges and aquatic earthworms. Ponds with well-developed aquatic plants along the margins support free-swimming aquatic insects such as water striders and water boatmen. Predatory dragonfly nymphs are present in some of the ponds.

Large macroinvertebrates such as crayfish and snails are potentially important as prey for species such as largemouth bass, mallards, great blue herons, and raccoons in ponds and streams at the Site.

Fish

As with macroinvertebrates, low and intermittent flows along most stream reaches within the Site greatly limit the presence of fish at the Site. Species captured during sampling of streams have included the fathead minnow, creek chub, stoneroller, and green sunfish. Of these, the

creek chub is the most tolerant of poor water conditions and reportedly inhabits virtually all streams within its range that are capable of supporting fish. Creek chubs feed on a variety of small invertebrate prey; fathead minnows feed primarily on plankton; stonerollers consume both plant and invertebrate prey; and green sunfish feed on free-swimming invertebrates and smaller fish.

Fish communities in ponds are highly influenced by the presence of suitable substrates, aquatic vegetation, and persistence of water as well as by historical introductions. Species present include the four species listed above, plus the golden shiner, white sucker, and largemouth bass. Golden shiners feed on a variety of small prey and algae and may themselves be important prey for larger fish and fish-eating birds because of the large populations they attain and their relatively large size. White suckers feed on insect larvae and algae.

Environmental Effects

This section characterizes the impacts that would likely result from the implementation of each of the three alternatives included in this environmental assessment. In each case, the effects of the alternatives have been compared to the vegetation management practices that have been used since 1990 in the buffer zone. Table E-1 on the following page summarizes the impacts of each alternative.

No Action - Under the no action alternative, noxious and other weeds would not be treated using herbicides, or manual or mechanical means. It is likely that the noxious weeds already firmly established in the buffer zone would continue to increase and spread into adjacent areas across the buffer zone and onto neighboring lands.

Native perennial plant species, including those in sensitive habitats such as wetlands, would likely be crowded out and partially replaced by non-native noxious weeds under the no action alternative. Noxious weeds, such as diffuse knapweed on the pediments where the xeric tallgrass prairie is found, would become dominant in the communities they infest. Sunlight, moisture, and nutrients used by weeds would be unavailable to the native grasses and forbs in favor of dominant stands of weeds. In time, the diversity of native plant species would be greatly reduced. This reduction in plant diversity would likely cause declines in bird, mammal, reptile and insect species that inhabit prairie plant communities.

Large, scattered but very dense stands of Canada thistle are now located in the wetlands, wetland margins, and wet meadows along streams, where they displace nearly all-native plant species. While this species is used as cover by the Preble's meadow jumping mouse, it also reduces valuable native plant cover that is used by other wildlife species. Under the no action alternative, stands of Canada thistle would likely continue to spread throughout more of the wetlands and riparian zone along creeks in the buffer zone.

Grasslands would not be subjected to controlled burning, and insects that feed on weeds would not be released under the no action alternative. Accumulations of dead vegetative growth from previous years would remain in place in grasslands in the buffer zone. Minerals tied up in the dead vegetation would not be made available to new growth. Scattered insect populations would gradually decline in the weed communities where they currently reside. These insects would continue to reduce weed growth and seed production of the plants they live on, but would be unlikely to become a large factor in weed control.

Table E-1
Environmental Effects

	No Action Effects	Current Action Effects	Comprehensive Action Effects
Herbicide application	The current program of truck mounted and hand held application of herbicides would be discontinued the spread of noxious weeds would accelerate. The native plant communities would be expected to decline as noxious invaders increase. Weeds would continue to invade wetland communities and Preble's meadow jumping mouse habitat reducing the quality of the communities.	Weeds on approximately 250 acres of land treated with herbicides would be killed or set back for approximately three growing seasons. Spread of noxious weeds by wind blown seed would be reduced or prevented on acreage directly down wind from the 250 acres that are sprayed annually. Native vegetation in the treated 250 acres would exhibit some physiological damage and slowing of growth as a result of herbicide application for the first growing season after application. Native vegetation is expected to recover from the effects of herbicides and increase productivity in the second and successive growing seasons after application.	Weeds on approximately 1750 acres of land treated with herbicides would be killed or set back for approximately three growing seasons. Spread of noxious weeds by wind blown seed would be reduced or prevented on acreage directly down wind from the 1750 acres that are sprayed annually. Native vegetation in the treated 1750 acres would exhibit some physiological damage and slowing of growth as a result of herbicide application for the first growing season after application. Native vegetation is expected to recover from the effects of herbicides and increase productivity in subsequent growing seasons due to weed control.
Biological controls	No additional biological controls (insects) would be introduced. Insects that survive from previous years would continue to feed on the weed communities they currently inhabit. In those communities, insects would continue to limit the production of seeds and slow the growth of their hosts.	Members of one species of biological control (insects) would be introduced annually to feed on weeds. Insects that survive from previous years would continue to feed on the weed communities they currently inhabit. In those communities, insects would continue to limit the production of seeds and slow the growth of their hosts. Insect populations would be expected to gradually increase as more insects are added each year.	Members of one species of biological control (insects) would be introduced annually to feed on weeds. Insects that survive from previous years would continue to feed on the weed communities they currently inhabit. In those communities, insects would continue to limit the production of seeds and slow the growth of their hosts. Insect populations would be expected to gradually increase as more insects are added each year.
Cultural practices	Acreage disturbed by routine activities in the buffer zone (1-15 acres/yr) would be not be reclaimed and would be susceptible to infestation by weed species.	Weed infestation would be reduced on acreage disturbed by routine activities in the buffer zone (1-15 acres/yr) by reseeding and application of mulch.	Weed infestation would be reduced on acreage disturbed by routine activities in the buffer zone (1-15 acres/yr) and undisturbed areas where vegetation is sparse (up to 20 acres/yr) by reseeding and application of mulch.

Table E-1
Environmental Effects

	No Action Effects	Current Action Effects	Comprehensive Action Effects
Mechanical controls	Weed populations would not be removed along roads by mowing and grading. Weeds that gather along fence lines would remain in place and provide a seed source for future generations. Trapped weeds and high winds would exert pressure on chain link fences and cause them to lean or collapse. Small isolated communities of noxious weeds would not be hand pulled or dug but would be left to reproduce and spread.	Cutting back or removing weeds along 35 miles of roads by mowing and grading would kill the weeds or greatly reduce their seed producing capabilities for one growing season. Weeds that gather along fence lines would be removed and disposed as waste in a landfill. The seed source for future generations of weeds would be buried in a landfill. Damage to chain link fencing would be avoided by removing trapped weeds Small isolated communities of noxious weeds would be removed and prevented from spreading.	Cutting back or removing weeds along 35 miles of roads by mowing and grading would kill the weeds or greatly reduce their seed producing capabilities for one growing season. Weeds that gather along up to six miles of fence lines would be removed and burned releasing small amounts of pollution within permitted limits into the air. The small amount of seed remaining in the seed heads would be burned. Damage to chain link fencing would be avoided by removing trapped weeds. Small isolated communities of noxious weeds would be removed and prevented from spreading.
Prescribed fires	No prescribed fires would be used and accumulations of dead vegetation would not be removed from grassland communities. No pollutants would be released into the air. The wildfire hazard from lightning strikes on thatch accumulations would remain at present levels.	No prescribed fires would be used and accumulations of dead vegetation would not be removed from grassland communities. No pollutants would be released into the air. The wildfire hazard from lightning strikes on thatch accumulations would remain at present levels. The quality of the native grasslands would continue a slow decline. With the decline of native species, noxious weeds would continue to gain dominance in the grasslands.	Prescribed fires would be used to remove accumulations of dead vegetation from grassland communities on up to 500 acres per year. Burning vegetation would release pollutants within permitted limits into the air during the duration of the burn, up to six hours. Personnel attending prescribed fires may inhale air pollutants, and in some areas of the buffer zone, suspended radionuclides, in smoke from the fire. Radioactive doses received from smoke inhalation would be well below regulatory dose limits. The vigor of native plant communities would increase after thatch removal and release of nutrients from burned thatch. Hazards from lightning caused fires would be reduced by thatch removal. 25 to 30 cubic yards of weeds that gathered along up to six miles of fence lines would be removed and burned releasing small amounts of pollution, within permitted limits, into the air.

Current Action - Under the current action alternative, herbicides and other manual and mechanical means of controlling weeds would continue on about 250 acres of land each year. This level of controls has not been effective in stemming the spread of noxious weeds across the buffer zone during the past few years, and it is likely that the spread of noxious weeds would not be halted or the weed populations reduced. Communities of native plants would continue to be invaded by noxious weed species, including grasslands and riparian zones much as described above in the no action alternative. Wildlife habitat quality would slowly degrade, and species diversity would decline.

Grasslands would not be burned under the current action alternative. The goal of removing accumulations of dead vegetation and recycling the nutrients they contain would not be achieved. No additional air pollution would be generated since no controlled burns would be conducted.

Release of insects that live on weed species would continue at about one release per year. This level of releases is expected to maintain the populations of weed eating insects in the buffer zone. Insects are not expected to become a large factor in weed control.

Comprehensive Action - Under the comprehensive action alternative, up to 1750 acres of the buffer zone would be treated with herbicides, or with manual or mechanical methods each year. This level of treatment is expected to stop the spread of noxious weeds across the buffer zone and onto neighboring lands. This level of herbicide treatment will gradually reduce the total acreage infested by weeds within the buffer zone over time.

A reduction in weed populations is expected to have a positive effect on native plant communities and wildlife. Every plant community, from grasslands to wetlands, is expected to benefit from reduced competition from weeds. The native plant communities would increase in vigor and retain their current diversity. Wildlife would benefit from increased native vegetation as both a food source and as cover.

All herbicides used at Rocky Flats are tested and approved by the Environmental Protection Agency. Concentrations used at the site will follow the manufacturer's guidelines and will be well within the Federal limits for application. As noxious weed populations are reduced and native species return, the use of herbicides can be scaled back.

For a time, herbicides applied to noxious weeds would have a detrimental effect on the native plants that are also treated. Studies have shown that the growth of native vegetation is slowed, and in some cases the aboveground portion of the plants is killed in the growing season that herbicides are applied. Those studies also show that the below ground portions of most native plants survive herbicide application, and native plants tend to recover and add more vigorous growth in the growing seasons following herbicide application. Specifically, this was the case with regard to the use of Picloram as documented in the Bureau of Land Management's 1991 Environmental Impact Statement for *Vegetation Treatment on BLM Lands in Thirteen Western States.* Similar results have previously been documented by Boulder County Parks and Open Space. Rice and Toney (reference 13) found that grassland communities showed high level resilience and rate of recovery after application of picloram.

DOE has been monitoring test plots where certain chemical compounds have been used to determine their beneficial and detrimental effects before using them on a broad scale. In the case of the herbicides Transline, and Tordon 22K, beneficial and detrimental effects have been monitored in treated areas to determine if desirable vegetation has been impacted. Specific monitoring of Tordon 22K application areas compared to adjacent control plots shows some short-term impact on native perennials in the prairie areas that were treated. Affected native forbs were

weakened but not killed. These short-term impacts quickly reversed, and no noteworthy impacts to native forbs were recorded the year after application, while several undesirable alien forbs succumbed. Several of the native grass species benefited. Most dramatic was the invigoration of big bluestem (*Andropogon gerardii*), one of the indicator species of the xeric tallgrass prairie that DOE is attempting to preserve.

In the growing season of the application of herbicides, the density of vegetation may be reduced enough that surface water runoff and erosion increase. As target weeds are replaced by native grasses, erosion and surface runoff will be reduced to pre-treatment levels in subsequent years.

Herbicides can enter streams and ponds through accidental direct application, drift, or surface and subsurface water runoff. These impacts are not expected to occur at Rocky Flats because spraying will not occur near water courses. Aerial application of herbicides presents the greatest risk for direct application and drift to water bodies, and special precautions are taken to provide adequate protection of aquatic habitats depending on herbicide type. Currently as a protective measure for Preble's mouse habitat, guidance from the U.S. Fish and Wildlife Service restricts application of Tordon 22K to areas 30 feet from onsite irrigation ditches using a truck mounted sprayer. A 100 foot setback will be observed during aerial spraying in the buffer zone to protect the plant community in the riparian corridor and avoid Preble's mouse habitat and associated wetlands. Ideally, herbicide application would occur early in the spring before the mouse emerges. The level of impacts from aerial spraying and truck mounted spraying are expected to be substantially the same.

Herbicides are not expected to infiltrate soils and affect groundwater. DOE has carefully examined the permeability of Rocky Flats soils identified at the Site. While the soils do have a high gravel content, the series present at Rocky Flats are not highly permeable because they also have a high clay content. The Rocky Flats environment is quite different from sandy, highly permeable soils with high water tables for which the cautions for herbicide use were written.

Up to 500 acres of land would be treated with prescribed burns each year under the comprehensive action alternative. Burning of old vegetation would improve the growing conditions of native grasses and forbs by releasing nutrients tied up in the dead material and increasing the light available to plants and seedlings. The potential for uncontrolled rangeland fires to damage Rocky Flats facilities and adjacent private property would be reduced by thatch removal.

A radiation dose assessment was conducted at Rocky Flats to determine the dose that would result from burning vegetation growing in areas of radioactively contaminated soils east and southeast of the 903 Pad. The analysis considered the effects of inhalation of smoke from a controlled burn of approximately 300 acres lasting six hours. The location chosen for the study extended from the 903 Pad east to the Indiana Street fence line. The analysis concluded that small amounts of Plutonium and Americium would become airborne in the smoke generated by a controlled burn. The dose calculations conclude that the dose to workers tending the fire could be 0.014 millirems during the duration of a controlled burn. The dose at the nearest off-site residence down wind of the fire would be 0.0029 millirems from a controlled burn. These levels of radionuclide exposure are well below the Federal 10-millirem annual radiation dose limit to the members of the public from radioactive material in the air.

The Colorado Department of Public Health and the Environment performed an analysis of the emissions recorded during two lightning caused range fires in 1994 and 1996. Records from air samplers located at the Site boundary during the range fires show that no elevated levels of

radionuclides were detected in air samples as a result of those fires. The emissions did not exceed the standards for air emissions for the Site.

As a part of an environmental impact statement for weed control on public lands in the West, the Bureau of Land Management conducted a risk analysis to determine the health risks to personnel who are participating in a controlled burn. Their study indicated that risks to personnel would come from gases and particulate matter contained in the smoke. The study concluded that the risk of a worker developing cancer as a result of exposure to smoke from range fires for six hour per day and 20 days per year over the course of ten years is 3.72×10^{-8} or 3.72 chances in one hundred million. Similarly, members of the public two miles from a controlled burn site would have a risk level of 1.16×10^{-8} or 1.16 in one billion of contracting cancer as a result of inhaling smoke for six hours per day, 20 days per year, over a ten year time span. Controlled burns at Rocky Flats would be conducted on fewer than 20 days per year.

Release of insects that live on weed species would occur at about one release per year. This level of releases is expected to maintain the existing populations of weed eating insects in the buffer zone. Insects are not expected to become a large factor in weed control.

Conclusions

This environmental assessment contains an analysis of a range of vegetation management techniques that could be used to suppress weeds and encourage the growth of native plant species in the buffer zone at Rocky Flats. The effects of mechanical removal, use of herbicides applied either by hand, using a truck mounted sprayer, or by aircraft, release of insects, and conduct of controlled burns were analyzed. Based on the results of the analysis contained in this environmental assessment, none of the vegetation management techniques described in the alternatives would result in impacts that violate applicable standards for environmental quality or human health. Local governments, nearby residents, and the public will be notified in advance of controlled burns scheduled to be conducted at Rocky Flats.

DOE will continue to monitor the effectiveness of vegetation management activities conducted in the buffer zone and adjust the prescriptions for weed controls accordingly. The results of monitoring will be recorded in the annual vegetation monitoring reports which are placed in the Rocky Flats reading rooms.

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APPENDIX A

Management Techniques, Issues and Other Concerns Identified at Public Meetings

Vegetation Information and Management Meeting Objectives

Public Meeting Held on 8/26/98

1. Provide information about vegetation management options
2. Identify public issues and concerns to be taken into account in developing management alternatives.

Concerns Raised At The Meeting

Herbicides

- Toxicity - acute, chronic
- Environmental Fate - how long before it breaks down in the environment
- Transport - how might herbicides be transported through air, water, soil
- Application techniques that would be used
- Sensitivity or allergic reactions to chemicals

Burning:

- Air pollution
- H2O pollution
- Actinide release from soils and plant uptake of plutonium
- Identifying areas suitable for burning
- Erosion of contaminated soils
- Site personnel level of experience with controlled burns

Biological weed control:

- Biological control agents attacking native plants
- Biological control agents going out of control

No Action Alternative Concerns

Impacts to adjacent property from fires that are not controlled
Impact on habitats from weed invasion
Impact on native species from failure to control weeds
Regulatory compliance
Natural resources stewardship
Land use diversity

Other Concerns to be Considered

- Mapping of contaminated areas
- Monetary impacts of delay in action
- Integration of methods of vegetation management
- Notification to public before weed control activities or controlled burns
- No silver bullet that fixes the weed problem
- Challenges are not unique
- What are other DOE Sites such as Hanford doing
- Relative impacts to sensitive plant and animal species from each technique
- Weed pulling by volunteers
- Prescriptions for burning and aerial applications of herbicides
- Ensure proper permitting
- Take actions in concert with surrounding areas
- Would grazing ever be a potential management tool
- Proactive approach to chemically sensitive people

APPENDIX A

Management Techniques, Issues and Other Concerns Identified at Public Meetings

9/16/98 Public Meeting - Draft Alternatives to be Analyzed

Techniques Available	No Action	Current Action	Comprehensive Action	Related Issues to be Addressed in EA
Herbicide application				
truck mounted spray spot spray aerial spray wick application	none	truck mounted spray spot spray	truck mounted spray spot spray aerial spray	Toxicity; human sensitivity to chemicals How long do they stay active Transport in the environment Application techniques used
Biological controls				
release insects revegetate with natives introduce wild grazers domestic livestock use bacteria or viruses	none	release insects revegetate with natives	Increase insect release revegetate with natives	Insects attacking native plants Insects going out of control
Mechanical controls				
mowing roadsides cutting along fences gathering weeds grading roads hand pulling wash vehicle tires construct catch fences	none	mowing roadsides cutting along fences gathering weeds grading roads hand pulling	mowing roadsides cutting along fences gathering weeds grading roads hand pulling construct catch fences	Effect of catch fence on animal movement
Cultural practices				
apply fertilizers reseed disturbed areas till and reseed inoculate soils mow tall grass mulch	none	reseed disturbed areas mulch	reseed disturbed areas till and reseed mulch	
Prescribed fires				
spot burns area burns - spring area burns - fall	none		spot burns area burns - spring area burns - fall	Air and water pollution Use temporary air monitors during burns Actinides in soils or plants released Identifying areas suitable for burns Erosion of contaminated soils Site level of experience with burns Impacts to adjacent property Sample burned plant residue for actinides

APPENDIX A

Management Techniques, Issues and Other Concerns Identified at Public Meetings

9/16/98 Public Meeting

Other Issues to be Addressed in the EA	Other Concerns about the Plan
Impact on habitats from weed invasion Impact on native species from failure to control weeds	Maintain regulatory compliance Natural resources stewardship Land use diversity Mapping of contaminated areas Monetary impacts of delay in action Integration of methods of vegetation management Notification to public before weed control activities or controlled burns Recognize that there is no silver bullet for weed problems Recognize that these challenges are not unique to Rocky Flats What are other DOE Sites such as Hanford doing Relative impacts to sensitive plant and animal species from each technique Prescriptions for burning and aerial applications of herbicides Ensure proper permitting Take actions in concert with surrounding areas Seek help from other agencies with fire experience

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Appendix B

This section contains information compiled by the U.S. Department of Agriculture and the Forest Service on a sample of the herbicides discussed in the Vegetation Management Environmental Assessment. These fact sheets contain herbicide manufacturer's information on Use, Environmental Effects/Fate, Ecological Effects, Toxicology Data, and General Facts. A full listing of these and other chemical herbicides found in the Vegetation Management Environmental Assessment can be found on the World Wide Web at: http://www.infoventures.com/e-hlth/pestcide/pest-fac.html

PICLORAM

Pesticide Fact Sheet
Prepared for the U.S. Department of Agriculture, Forest Service,
by Information Ventures, Inc.

This fact sheet is one of a series issued by the Forest Service, the Bureau of Land Management, and the Bonneville Power Administration for their workers and the general public. It provides information on forestry and land management uses, environmental and human health effects, and safety precautions for the herbicide picloram and its formulations. Unless otherwise stated, the toxicity data presented in this fact sheet refer to the active ingredient, picloram. When included, data on formulated products will be specifically identified. A list of definitions is included in Section VIII of the fact sheet.

I. Basic Information

Common name: Picloram

Chemical name: 4-amino-3,5,6 -trichloropicolinic acid

Common Product names: Tordon, Grazon, Access, Pathway

Pesticide classification: herbicide

Registered Use Status: All formulations that may be broadcast on soil or foliage are classified as "Restricted Use" pesticides. Sales and use of these pesticides are limited to licensed pesticide applicators or their employees, and only for uses covered by the applicator's certification. This is due to picloram's mobility in water, combined with the extreme sensitivity of many important crop plants to damage.

Formulations: Commercial picloram products generally contain one or more inert ingredient. An inert ingredient is anything added to the product other than an active ingredient. Because of concern for human health and the environment, the U.S. Environmental Protection Agency (EPA) announced its policy on toxic inert ingredients in the Federal Register on April 22, 1987 (52 FR 13305). The intent of this policy is the regulation of inert ingredients. EPA's strategy for the implementation of this policy included the development of four lists of inerts based on toxicological concerns. Inerts of toxicological concern were placed on List 1. Potentially toxic inerts/high priority for testing were placed on List 2. Inerts of unknown toxicity were placed on List 3 and inerts of minimal concern were placed on List 4.

For pesticides containing List 1 inerts, the EPA has given the pesticide registrant the opportunity to reformulate the product to remove the List 1 inerts. If the registrant chooses not to reformulate the product, then the List 1 inerts must be identified on the product label. For List 2 inerts, the EPA is monitoring ongoing testing and gathering existing information on the potential adverse effects of these chemicals to determine if further regulatory action is required. The EPA has no particular regulatory plans for List 3 and List 4 inerts. The Forest Service will incorporate new data on inerts into updated fact sheets as it becomes available.

The contents of two picloram formulations are listed below.

Tordon K: picloram, as the potassium salt (24.4%) and inert ingredient(s) (75.6%) including water and dispersing agents

Grazon PC: picloram, as the potassium salt (24.4%) and inert ingredient(s) (75.6%) including water and dispersing agents

Residue assay methods: Gas/liquid chromatography and reverse phase high performance liquid chromatography methods are available for residue assay.

II. Herbicide Uses

Registered forestry, rangeland, right-of-way uses: Picloram is used to prevent regrowth of woody plants in rights-of-way, such as along roads and power lines. On rangelands, it is used to control noxious weeds and brush. In forestry, picloram is used to control unwanted trees and to prepare sites for planting trees. It is also used to control plants on non-crop industrial/facility sites.

Operational details:

Target Plants: Picloram is used to control broadleaf plants, brush, conifers and broadleaf trees.

Mode of action: Picloram is absorbed through plant roots, leaves and bark. It moves both up and down within the plant, and accumulates in new growth. It acts by interfering with the plant's ability to make proteins and nucleic acids. Picloram is metabolized or broken down by plants into carbon dioxide, oxalic acid, 4-amino-2,3,5 -trichloropyridine and 4-arnino-3,5-dichloro-6 -hydroxypicolinic acid.

Method of application: broadcast or spot treatment as foliar (leaf) or soil spray; basal spot treatment; tree injection; frill treatment; stump treatment; basal bark treatment; low-volume dormant stem spray; by air as broadcast or low volume dormant spray.

Use rates: The amount to be applied depends on the type of plant to be killed, and the formulation of picloram used.

. Picloram, triisopropanolamine salt: 0.27 to 2.16 pounds acid equivalent per acre (lb ae/A)
. Picloram, isooctyl ester: used for basal bark treatment only
. Picloram, potassium salt: 1.0 to 8.5 lb ae/A

Special Precautions: Always read all of the information on the product label before using any pesticide. Read the label for application restrictions.

Timing Of Application: Picloram can be applied from spring through three weeks before the first frost. It should not be applied on snow or frozen ground. Basal treatments can be applied throughout the year. Tree injection should not be done during periods of heavy sap flow.

Drift Control: Do not allow careless application or spray drift. Do not permit spray or spray drift to contact desirable plants.

III. Environmental Effects/Fate

Soil:

Residual Soil Activity: Picloram can stay active in soil for a moderately long time, depending on the type of soil, soil moisture and temperature. It may exist at levels toxic to plants for more than a year after application at normal rates.
Adsorption: Picloram chemically attaches to clay particles and organic matter. If the soil has little clay or organic matter, picloram is easily moved by water.
Persistence and Agents of Degradation: Long-term build-up of picloram in the soil generally does not occur. Break-down caused by sunlight and microorganisms in the soil are the main ways in which picloram disappears in the environment. Picloram will dissipate more quickly in warm, wet weather. Alkaline conditions, fine textured clay soils, and a low density of plant roots can increase the persistence of picloram.
Metabolites/Degradation Products and Potential Environmental Effects: Carbon dioxide is the major end-product of the break-down of picloram in the soil. Carbon dioxide is a gas normally found in the air. The relatively small amount from picloram break-down would not be expected to have any harmful effect on the environment.

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Water:

Solubility: Picloram dissolves readily in water.
Potential For Leaching Into Ground-Water: Picloram can leach into ground-water under certain soil and weather conditions.

Picloram leaches more easily in soils which have low organic content or are very sandy. Picloram movement is greatest for soils with low organic matter content, alkaline soils, and soils which are highly permeable, sandy, or light-textured. Where the water table is very shallow, picloram may leach into ground-water. Picloram should not be applied to any surface which would allow direct pollution of ground-water.

Surface Waters: picloram can be carried by surface run-off water. To prevent water pollution, picloram spray drift or run-off should not be allowed to fall onto banks or bottoms of irrigation ditches, or water intended for drinking or household use. Picloram should not be applied directly to water or wetlands, such as swamps, bogs, marshes or potholes.
Air:

Volatilization: Picloram does not evaporate easily.
Potential For By-Products From Burning of Treated Vegetation: More than 95% of picloram residue is destroyed during burning. Although by-products from burning plants treated with picloram have been identified in the laboratory, they have not been identified in the field.

IV. Ecological Effects

Non-Target Toxicity:

Soil Microorganisms: Picloram has very low toxicity to soil microorganisms at up to 1,000 parts per million.
Plants: Picloram is highly toxic to many non-target plants. Most grasses are resistant to picloram. Picloram is active in the soil and can pass from soil into growing plants. It can move from treated plants, through the roots, to nearby plants. Spray drift may kill plants some distance away from the area being treated. Irrigation water polluted with picloram may damage or kill crop plants.
Aquatic Animals: Picloram is moderately to slightly toxic to freshwater fish, and slightly toxic to aquatic invertebrate animals; it does not build up in fish. The formulated product is generally less toxic than picloram. Picloram and its formulations have not been tested for chronic effects in aquatic animals. Acute toxic level:

Species	LC50	Source Table
Fish	4.0 to 24.0 ppm	(Table II, Aquatic)
Invertebrates	10.0 to 68.3 ppm	(Table II, Aquatic

Terrestrial Animals: Picloram is almost non-toxic to birds. It is relatively non-toxic to bees.
Picloram is low in toxicity to mammals; animals excrete most picloram in the urine, unchanged. The formulated product is generally less toxic than picloram. Picloram and its formulations have not been tested for chronic effects in terrestrial animals. Acute toxic level:

Species	LD50	Source Table
Birds	<2,000 mg/kg	(Table II, Avian)
Mammals	<950 to 8,200 mg/kg	(Table II, Mammalian)
Bees	48 hour contact toxicity to bees = 14.5 micrograms per bee	--

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Threatened and Endangered Species: Picloram may be a hazard to endangered plants when used on pastures, rangeland and forests. Picloram maybe a hazard to some endangered invertebrates if it is applied to areas where they live. It is not expected to be a hazard to other endangered animals or birds.

V. Toxicology Data

Acute toxicity:

Acute oral toxicity: In tests in male rats, the acute oral LD50 was greater than 5,000 mg/kg. (Toxicity Category IV) In tests in female rats, the acute oral LD50 was 4012 mg/kg. (Toxicity Category III; See Table I, Oral)

Acute dermal toxicity: The acute dermal (skin) LD50 was greater than 2,000 mg/kg in rabbits. (Toxicity Category III, Table I, Dermal)
Primary irritation score: In laboratory tests in rabbits, picloram was not an irritant. (Toxicity Category IV, Table I, Skin irritation)
Primary eye irritation: In laboratory tests in rabbits, picloram was a moderate eye irritant. (Toxicity Category III, Table I, Eye irritation)
Acute inhalation: In laboratory tests in rats, the acute LC50 was greater than 0.035 milligrams/liter. (Toxicity Category I, Table I, Inhalation)

Chronic Toxicity:

Carcinogenicity: The potential for causing tumors (oncogenicity) has not been determined at this time. The Environmental Protection Agency is presently requiring that the mouse and rat oncogenicity tests be repeated.
Developmental: A study in rats indicated no evidence of teratology (birth defects). The Environmental Protection Agency is presently requiring repeat or additional teratology studies in rats and rabbits.
Reproduction: A multi-generation reproduction study in rats did not show any adverse effects on reproduction at doses up to 150 mg/kg per day. The Environmental Protection Agent y is currently requiring an additional two-generation reproduction study in rats.
Mutagenicity: Picloram was negative in two tests for mutagenicity (the ability to cause genetic damage).

The data reported above are results of animal studies which the Environmental Protection Agency has evaluated in support of the registration of picloram. These data are used to make inferences relative to human health.

HAZARD: Based on the results of animal studies, picloram does not cause genetic damage or birth defects, and has little or no effect on fertility or reproduction. There is not enough information available at this time to determine whether picloram causes cancer. There have been no reported cases of long term health effects in humans due to picloram exposure.

VI. Human Health Effects

Acute toxicity (poisoning):

Reported effects: A few cases of eye and skin irritation have been reported in workers exposed to picloram formulations.

Chronic toxicity:

Reported effects: There are no reported cases of long term health effects in humans due to picloram or its formulations.

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CLOPYRALID METHYL

Pesticide Fact Sheet
Prepared for the U.S. Department of Agriculture, Forest Service,
by Information Ventures, Inc.

This fact sheet is one of a series issued by the Forest Service, the Bureau of Land Management, and the Bonneville Power Administration for their workers and the general public. It provides information on forest and land management uses, environmental and human health effects, and safety precautions for the herbicide clopyralid and its formulations. Unless otherwise stated, the toxicity data presented in this fact sheet refer to the active ingredient, clopyralid. When included, data on formulated products will be specifically identified. A list of definitions is included in Section VIII of the fact sheet.

I. Basic Information

Common name: Clopyralid methyl

Chemical name: 3,6-dichloro-2-pyridinecarboxylic acid

Common Product names: Stinger, Reclaim, Transline

Pesticide classification: herbicide

Registered Use Status: "General Use"

Formulations: Commercial clopyralid products generally contain one or more inert ingredients. An inert ingredient is anything added to the product other than an active ingredient. Because of concern for human health and the environment, the U.S. Environmental Protection Agency (EPA) announced its policy on toxic inert ingredients in the Federal Register on April 22, 1987 (52 FR 13305). The intent of this policy is the regulation of inert ingredients. EPA's strategy for the implementation of this policy included the development of four lists of inerts based on toxicological concerns. Inerts of toxicological concern were placed on List 1. Potentially toxic inerts/high priority for testing were placed on List 2. Inerts of unknown toxicity were placed on List 3 and inerts of minimal concern were placed on List 4.

For pesticides containing List 1 inerts, the EPA has given the pesticide registrant the opportunity to reformulate the product to remove the List 1 inerts. If the registrant chooses not to reformulate the product, then the List 1 inerts must be identified on the product label. For List 2 inerts, the EPA is monitoring ongoing testing and gathering existing information on the potential adverse effects of these chemicals to determine if further regulatory action is required. The EPA has no particular regulatory plans for List 3 and List 4 inerts. The Forest Service will incorporate new data on inerts into updated fact sheets as it becomes available.

The contents of three clopyralid formulations are listed below.

Reclaim: clopyralid (40.9%) and inert ingredients (water, isopropyl alcohol, and a proprietary surfactant)(59.1%)

Stinger: clopyralid (40.9%) and inert ingredients (water, isopropyl alcohol, and a proprietary surfactant)(59.1%)

Transline: clopyralid (40.9%) and inert ingredients (water, isopropyl alcohol, and a proprietary surfactant) (59.1%)

Residue assay methods: Gas/liquid chromatography methods are available for residue assay.

II. Herbicide Uses

Registered forestry, rangeland, right-of-way uses: control of weeds and woody plants on rangeland and permanent grass pastures, non-cropland areas, and rights-of-way.

Operational details:

Target Plants: Clopyralid is used to control brush and weed species including mesquite, acacias, other broadleaf plants, thistle, perennial sow-thistle, coltsfoot, and many weeds.

Mode of action: Clopyralid is absorbed by the leaves and roots of the weed and moves rapidly through the plant. It affects plant cell respiration and growth.

Method of application: Clopyralid is applied by aerial spraying; spraying from ground equipment.

Timing Of Application: Apply to actively growing brush or weeds during the spring or early summer. Fall treatments are not recommended.

Use rates: Use at 0.0625 to 4.0 pounds of active ingredient per acre.

Special Precautions: Always read all of the information on the product label before using any pesticide. Read the label for application restrictions.

Drift Control: Do not allow careless application or spray drift. Do not permit spray or spray drift to contact desirable plants as very small quantities may injure susceptible plants. Do not allow spray to drift onto banks or bottoms of irrigation ditches. Do not apply by aircraft when an air temperature inversion exists. Spray only when wind velocity is low.

Ground Water: Do not apply clopyralid to areas where soils are very permeable (such as sandy soils) and the water table is shallow. Do not apply to soils containing sinkholes over limestone bedrock, or severely fractured surfaces. Do not apply where the surface would allow clopyralid to be introduced directly into an aquifer.

Surface Water: Do not contaminate water when disposing of equipment wastewater. Do not contaminate water used for irrigation or domestic use.

Crops: Do not transfer livestock from treated grazing areas onto sensitive broadleaf crop areas without first allowing 7 days of grazing on untreated pasture. Straw from treated areas or manure from animals that have grazed treated areas should not be used for comporting or mulching on ground where susceptible crops may be grown the next season.

Soil: Do not move treated soil. Avoid situations where treated soil particles may blow into areas where susceptible plants grow.

III. Environmental Effects/Fate

Soil:

Residual Soil Activity: Clopyralid is generally active in the soil. It is usually absorbed from the soil by plants.
Adsorption: Clopyralid is not strongly adsorbed by the soil.
Persistence and Agents of Degradation: Clopyralid maybe persistent in soils under anaerobic (no oxygen) conditions and in soils with a low microorganism content. The half-life in soil can range from 15 to 287 days. Soil microorganisms break down clopyralid.

Metabolizes/Degradation Products and Potential Environmental Effects: The only degradation product that has been identified is carbon dioxide. Other degradation products have not been identified.

Water:

Solubility: Clopyralid is highly soluble in water.
Potential For Leaching Into Ground-Water: Because clopyralid is highly soluble in water, does not adsorb to soil particles, and is not readily decomposed in some soils, it may leach into ground-water. Ground-water may be contaminated if clopyralid is applied to areas where soils are very permeable and the water table is shallow. There is a potential for clopyralid to contaminate ground-water if it is applied to soils containing sinkholes or severely fractured surfaces.
Surface Waters: Because clopyralid is highly soluble in water, there is a potential for surface waters to be contaminated if clopyralid is applied directly to bodies of water or wetlands.

Air:

Volatilization: Clopyralid does not evaporate easily.

Potential For By-Products From Burning of Treated Vegetation: No information is available.

IV. Ecological Effects

Non-Target Toxicity:

Soil Microorganisms: No information is available.
Plants: Contact with non-target plants may injure or kill the plants.
Aquatic Animals: Clopyralid is of low toxicity to fish and aquatic invertebrate animals. Clopyralid does not build up (bioaccumulate) in fish tissues. Acute toxic level:

Species	LC50	Source Table
Fish	105-124 ppm	(Table II, Aquatic)
Daphnia	232 ppm	(Table II, Aquatic)

Terrestrial Animals: Clopyralid is of low toxicity to birds and mammals. Clopyralid is not toxic to bees. Acute toxic level:

Species	LC50	Source Table
Birds	<4,640	(Table II, Avian, dietary)
Species	LD50	Source Table
Bees	<100 micrograms/bee	--

Threatened and Endangered Species: Clopyralid may be a hazard to endangered plants if it is applied to areas where they live. The use of clopyralid on rangelands is subject to the rangeland endangered species cluster.

V. Toxicology Data

Acute toxicity:

Acute oral toxicity: Clopyralid had an acute oral LD50 of greater than 4,300 mg/kg in rats. (Toxicity Category III, Table I, Oral).
Acute dermal toxicity: In rabbits, clopyralid had an acute dermal LD50 of greater than 2,000 mg/kg. (Toxicity Category III, Table I, Dermal).
Primary irritation score: Clopyralid produced slight skin irritation when tested in rabbits. (Toxicity Category IV, Table I, Skin Irritation).
Primary eye irritation: Clopyralid caused eye irritation in rabbits. (Toxicity Category II, Table I, Eye Irritation).
Acute Inhalation: Rats showed no adverse effects after 4 hours of exposure to clopyralid at a concentration of 1.3 mg/L of air. (Toxicity Category III, Table I, Inhalation).

Chronic toxicity:

Carcinogenicity: Clopyralid showed no evidence of oncogenicity in a 2 year feeding study in mice at 2,000 mg/kg (highest dose tested) or in a 2 year feeding study in rats at 1,500 mg/kg (highest dose tested).
Developmental: Clopyralid showed no evidence of developmental toxicity in rats or rabbits at 250 mg/kg (highest dose tested).
Reproduction: No effects on reproduction were observed in a two generation study in rats treated with 1500 mg/kg clopyralid (highest dose tested).
Mutagenicity: Clopyralid showed no evidence of mutagenicity in the following laboratory tests: dominant lethal assay, rat cytogenetic study, in-vitro (test tube) assays in bacteria (Salmonella) and yeast (Saccharonzyces), and mouse host mediated assay.

HAZARD: Based on the results of animal studies, clopyralid is not classified as a carcinogen, teratogen, mutagen, or reproductive inhibitor.

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GLYPHOSATE

Pesticide Fact Sheet
Prepared for the U.S. Department of Agriculture, Forest Service,
by Information Ventures, Inc.

This fact sheet is one of a series issued by the Forest Service, the Bureau of Land Management, and the Bonneville Power Administration for their workers and the general public. It provides information on forest and land management uses, environmental and human health effects, and safety precautions for the herbicide glyphosate and its formulations. Unless otherwise stated, the toxicity data presented in this fact sheet refer to the active ingredient, glyphosate. When included, data on formulated products will be specifically identified. A list of definitions is included in Section VIII of the fact sheet.

I. Basic Information

Common name: Glyphosate

Chemical name: N-(phosphonomethyl)glycine

Common Product names: Roundup, Rodeo, Accord

Pesticide classification: herbicide

Registered Use Status: "General Use"

Formulations: Commercial glyphosate products generally contain one or more inert ingredients. An inert ingredient is anything added to the product other than an active ingredient. Because of concern for human health and the environment, the U.S. Environmental Protection Agency (EPA) announced its policy on toxic inert ingredients in the Federal Register on April 22, 1987 (52 FR 13305). The intent of this policy is the regulation of inert ingredients. EPA's strategy for the implementation of this policy included the development of four lists of inerts based on toxicological concerns. Inerts of toxicological concern were placed on List 1. Potentially toxic inerts/high priority for testing were placed on List 2. Inerts of unknown toxicity were placed on List 3 and inerts of minimal concern were placed on List 4.

For pesticides containing List 1 inerts, the EPA has given the pesticide registrant the opportunity to reformulate the product to remove the List 1 inerts. If the registrant chooses not to reformulate the product, then the List 1 inerts must be identified on the product label. For List 2 inerts, the EPA is monitoring ongoing testing and gathering existing information on tie potential adverse effects of these chemicals to determine if further regulatory action is required. The EPA has no particular regulatory plans for List 3 and List 4 inerts. The Forest Service will incorporate new data on inerts into updated fact sheets as it becomes available.

The contents of three glyphosate formulations are listed below.

Rodeo: glyphosate (53.5%) and water (46.5%)

Accord: glyphosate (41.5%) and water (58.5%)

Roundup: glyphosate (41%), polyethoxylated tallowamine surfactant (15%) and water (44%)

Residue assay methods: Gas/liquid chromatography and high performance liquid chromatography methods are available for residue assay.

II. Herbicide Uses

Registered forestry, rangeland, right-of-way uses: planting site preparation, conifer release, forest nurseries, rights-of-way and facilities maintenance, and noxious weed control

Operational details:

Target Plants: Glyphosate is used to control grasses, herbaceous plants including deep rooted perennial weeds, brush, some broadleaf trees and shrubs, and some conifers. Glyphosate does not control all broadleaf woody plants. Timing is critical for effectiveness on some broadleaf woody plants and conifers.

Mode of action: Glyphosate applied to foliage is absorbed by leaves and rapidly moves through the plant. It acts by preventing the plant from producing an essential amino acid. This reduces the production of protein in the plant, and inhibits plant growth. Glyphosate is metabolized or broken down by some plants, while other plants do not break it down. Aminomethylphosphonic acid is the main break-down product of glyphosate in plants.

Method of application: aerial spraying; spraying from a truck, backpack or hand-held sprayer; wipe application; frill treatment; cut stump treatment

Use rates: Use at 0.3 to 4.0 pounds of active ingredient per acre

Special Precautions: Always read all of the information on the product label before using any pesticide. Read the label for application restrictions.

Timing Of Application: Apply after leaves expand fully but before fall color change.

Drift Control: Do not allow careless application or spray drift. Do not permit spray or spray drift to contact desirable plants.

III. Environmental Effects/Fate

Soil:

Residual Soil Activity: Glyphosate is not generally active in the soil. It is not usually absorbed from the soil by plants.
Adsorption: Glyphosate and the surfactant used in Roundup are both strongly adsorbed by the soil.
Persistence and Agents of Degradation: Glyphosate remains unchanged in the soil for varying lengths of time, depending on soil texture and organic matter content. The half-life of glyphosate can range from 3 to 130 days. Soil microorganisms break down glyphosate. In tests, the surfactant in Roundup has a soil half-life of less than 1 week. Soil microorganisms break down the surfactant.
Metabolites/Degradation Products and Potential Environmental Effects: The main break-down product of glyphosate in the soil is aminomethylphosphonic acid, which is broken down further by soil microorganisms. The main break-down product of the surfactant used in Roundup is carbon dioxide.

Water:

Solubility: Glyphosate dissolves easily in water.
Potential For Leaching Into Ground-Water: The potential for leaching is low. Glyphosate and the surfactant in Roundup are strongly adsorbed to soil particles. Tests show that the half-life for glyphosate in water ranges from 35 to 63 days. The surfactant half-life ranges from 3 to 4 weeks.
Surface Waters: Studies examined glyphosate and aminomethylphosphonic acid (AMPA) residues in surface water after forest application in British Columbia with and without no-spray streamside zones. With a no-spray streamside zone, very low concentrations were sometimes found in water and sediment after the first heavy rain. Where glyphosate was sprayed over the stream, higher peak concentrations in water always occurred following heavy rain, up

to 3 weeks after application. Glyphosate and AMPA residues peaked later in stream sediments, where they persisted for over 1 year. These residues were not easily released back into the water.

Air:

Volatilization: Glyphosate does not evaporate easily.
Potential For By-Products From Burning of Treated Vegetation: Major products from burning treated vegetation include phosphorus pentoxide, acetonitrile, carbon dioxide and water. Phosphorus pentoxide forms phosphoric acid in the presence of water. None of these compounds is known to be a health threat at the levels which would be found in a vegetation fire.

IV. Ecological Effects

Non-Target Toxicity:

Soil Microorganisms: Glyphosate and the surfactant have no known effect on soil microorganisms.
Plants: Contact with non-target plants may injure or kill plants.
Aquatic Animals: Glyphosate is no more than slightly toxic to fish, and practically non-toxic to aquatic invertebrate animals. It does not buildup (bioaccumulate) in fish. The Accord and Rodeo formulations are practically non-toxic to freshwater fish and aquatic invertebrate animals. The Roundup formulation is moderately to slightly toxic to freshwater fish and aquatic invertebrate animals. Glyphosate and its formulations have not been tested for chronic effects in aquatic animals. Acute toxic level:

Rodeo and Accord

Species	LC50	Source Table
Fish	<1,000 ppm,	(Table II, Aquatic)
Water flea	930 ppm	(Table II, Aquatic)

Roundup

Species	LC50	Source Table
Fish	5 to 26 ppm	(Table II, Aquatic)
Invertebrates	4 to 37 ppm	(Table II, Aquatic)

Terrestrial Animals: Glyphosate is practically non-toxic to birds and mammals. It is practically non-toxic to bees. Glyphosate and its formulations have not been tested for chronic effects in terrestrial animals. Acute toxic level:

Species	LD50	Source Table
Bobwhite quail	3850 mg/kg	(Table II, Avian)
Bee	<100 micrograms/bee	--

Threatened and Endangered Species: Glyphosate may be a hazard to endangered species if it is applied to areas where they live.

V. Toxicology Data

Acute toxicity:

Acute oral toxicity: In tests in male and female rats, the acute oral LD50 was 4320 mg/kg. (Toxicity Category III, Table I, Oral).
Acute dermal toxicity: The acute dermal (skin) LD50 was equal to or greater than 794 mg/kg in

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female rabbits, and 5010 mg/kg in male rabbits. (Toxicity Category III, Table I, Dermal).
Primary irritation score: In laboratory tests in rabbits, glyphosate was not an irritant. (Toxicity Category IV, Table I, Skin irritation).
Primary eye irritation: In laboratory tests in rabbits, glyphosate was a mild eye irritant. (Toxicity Category III, Table I, Eye irritation).
Acute inhalation: The requirement for an inhalation study was waived by the Environmental Protection Agency.

Chronic toxicity:

Carcinogenicity: The Environmental Protection Agency has concluded that glyphosate should be classified as a compound with evidence of non-carcinogenicity for humans. This conclusion is based on the lack of convincing carcinogenicity evidence in adequate studies in two animal species.
Developmental: Laboratory studies with glyphosate in pregnant rats (at dose levels up to 3500 mg/kg per day) and rabbits (at dose levels up to 350 mg/kg per day) indicated no evidence of teratology (birth defects).
Reproduction: A three-generation reproduction study in rats did not show any adverse effects on fertility or reproduction at doses up to 30 mg/kg per day.
Mutagenicity: Glyphosate was negative in all tests for mutagenicity (the ability to cause genetic damage).

The data reported above are results of animal studies which the Environmental Protection Agency has evaluated in support of the registration of glyphosate. These data are used to make inferences relative to human health.

HAZARD: Based on the results of animal studies, glyphosate does not cause genetic damage or birthdefects, and has little or no effect on fertility, reproduction, or development of offspring. There is not enough information available at this time to determine whether glyphosate causes cancer. There have been no reported cases of long term health effects in humans due to glyphosate exposure.

DICAMBA

Pesticide Fact Sheet
Prepared for the U.S. Department of Agriculture, Forest Service,
by Information Ventures, Inc.

This fact sheet is one of a series issued by the Forest Service, the Bureau of Land Management, and the Bonneville Power Administration for their workers and the general public. It provides information on forest and land management uses, environmental and human health effects, and safety precautions for the herbicide, dicamba, and its formulations. Unless otherwise stated, the toxicity data presented in this fact sheet refer to the active ingredient, dicamba. When included, data on formulated products will be specifically identified. A list of definitions is included in Section VIII of the fact sheet.

1. Basic Information

Common name: Dicamba

Chemical name: 3,6-dichloro-2-methoxybenzoic acid

Common Product names: Banvel, Banex, Trooper

Pesticide classification: herbicide

Registered Use Status: "General Use"

Formulations: Commercial dicamba products generally contain one or more inert ingredients. An inert ingredient is anything added to the product other than an active ingredient. Because of concern for human health and the environment, the U.S. Environmental Protection Agency (EPA) announced its policy on toxic inert ingredients in the Federal Register on April 22, 1987 (52 FR 13305). The intent of this policy is the regulation of inert ingredients. EPA's strategy for the implementation of this policy included the development of four lists of inerts based on toxicological concerns. Inerts of toxicological concern were placed on List 1. Potentially toxic inerts/high priority for testing were placed on List 2. Inerts of unknown toxicity were placed on List 3 and inerts of minimal concern were placed on List 4.

For pesticides containing List 1 inerts, the EPA has given the pesticide registrant the opportunity to reformulate the product to remove the List 1 inerts. If the registrant chooses not to reformulate the product, then the List 1 inerts must be identified on the product label. For List 2 inerts, the EPA is monitoring ongoing testing and gathering existing information on the potential adverse effects of these chemicals to determine if further regulatory action is required. The EPA has no particular regulatory plans for List 3 and List 4 inerts. The Forest Service will incorporate new data on inerts into updated fact sheets as it becomes available.

The contents of three dicamba formulations are listed below.

Banvel: dimethylamine salt of dicamba (48.2%), dimethylamine salts of related acids (12%), and inert ingredients (39.8910)

Banvel CST: Dimethylamine salt of dicamba (13.3%), dimethylamine salts of related acids (3.3%), and inert ingredients (83.4910, including 30910 ethylene glycol)

Banvel SGF: sodium salt of dicamba (23.15%), sodium salts of related acids (5.79%), and water (71.06%)

Residue assay methods: Electron capture gas chromatography methods are available for residue assay.

II. Herbicide Uses

Registered forestry, rangeland, right-of-way uses: control of annual and perennial broadleaf weeds, brush, and vines in rangeland and non-cropland areas.

Operational details:

Target Plants: Dicamba is used to control broadleaf weeds, brush and vines.

Mode of action: Dicamba is absorbed by leaves and roots, and moves throughout the plant. In some plants, it may accumulate in the tips of leaves. Dicamba acts as a growth regulator. Some plants can metabolize or break down dicamba.

Method of application: ground or aerial broadcast, band treatment, basal bark treatment, cut surface treatment, spot treatment or wiper.

Use rates: Use at 0.25 to 8 pounds per acre

Special Precautions:

Always read all of the information on the product label before using any pesticide. Read the label for application restrictions.

Timing Of Application: Dicamba should generally be applied during periods of active plant growth. Spot and basal bark treatments can be applied when plants are dormant, but should not be done when snow or water prevent application directly to the ground.

Drift Control: Do not apply dicamba where it may move down in the soil or be washed along the soil surface to roots of desirable plants. Do not apply when air currents could carry spray to desirable plants. Leave buffer zones between area to be treated and desirable plants. Do not apply near desirable plants on days when the temperature is likely to exceed 85 degrees F. Do not apply from aircraft when desirable plants are growing near the area to be treated. Avoid fine sprays.

III. Environmental Effects/Fate.

Soil:

Residual Soil Activity: Dicamba is active in the soil.
Adsorption: Dicamba is not adsorbed by most soils. It is highly mobile in most soils.
Persistence and Agents of Degradation: Dicamba is moderately persistent in soil. It has a half-life of 1 to 6 weeks in soil. Dicamba is broken down by soil microorganisms. The break-down is slower at low temperatures and with low soil moisture. Dicamba breaks down faster in organic soils than in clay or sand.
Metabolites/Degradation Products and Potential Environmental Effects: The main metabolize or break-down product of dicamba in soil is 3,6-dichlorosalicylic acid.

Water:

Solubility: Dicamba is slightly soluble in water.
Potential For Leaching Into Ground-Water: Dicamba can leach into ground-water.
Surface Waters: Dicamba has been found in ground-water and surface water. Keep dicamba out of lakes, streams, ponds, irrigation ditches and domestic water.

Air:

Volatilization: Dicamba is relatively volatile. It can evaporate from leaf surfaces, and may evaporate from the soil.

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Potential For By-Products From Burning of Treated Vegetation: No information is available.

IV. Ecological Effects

Non-Target Toxicity:

Soil Microorganisms: Dicamba is almost non-toxic to microorganisms.
Plants: Dicamba is toxic to many broadleaf plants and to conifers. It does not injure most grasses.
Aquatic Animals: Dicamba is slightly toxic to fish and amphibians. It is practically non-toxic to aquatic invertebrates. Dicamba does not accumulate or build up in aquatic animals. Dicamba and its formulations have not been tested for chronic effects in aquatic animals. Acute toxic level:

Species	LC50	Source Table
Bluegill sunfish	<100 ppm	(Table II, Aquatic)
Amphibians	<10 ppm	(Table II, Aquatic)
Fish	<10 ppm	(Table II, Aquatic)

Terrestrial Animals: Dicamba and its formulations are slightly toxic to mammals. Dicamba and its formulations are practically non-toxic to birds. Dicamba is not toxic to bees. It does not accumulate or build up in animals. Dicamba and its formulations have not been tested for chronic effects in terrestrial animals. Acute toxic level:

Species	LD50	Source Table
Birds	673 to 2,000 mg/kg	(Table II, Avian)
Mammals	566 to 3,000 mg/kg	(Table II, Mammalian)

Threatened and Endangered Species: Use patterns of dicamba do not present any problem to endangered species.

V. Toxicology Data

Acute toxicity:

Acute oral toxicity: In tests in rats, the acute oral LD50 was 2.74 grams per kilogram. (Toxicity Category III, Table I, Oral)

Acute dermal toxicity: The acute dermal (skin) LD50 was greater than 2,000 mg/kg in rats. (Toxicity Category IV, Table I, Dermal)

Primary irritation score: In laboratory tests, dicamba was a slight skin irritant. (Toxicity Category IV, Table I, Skin irritation)

Primary eye irritation: In laboratory tests in rabbits, dicamba was corrosive. (Toxicity Category I, Table I, Eye irritation)

Acute inhalation: In laboratory tests in rats, the acute inhalation LC50 was greater than 200 milligrams per liter. (Toxicity Category IV, Table I, Inhalation)

Chronic Toxicity:

Carcinogenicity: Dicamba showed no evidence of carcinogenicity in dogs (at dose levels up to 50ppm in the diet for 2 years), mice (at up to 10,000 ppm in the diet for 14 to 19 months), or rats (at up to 500 ppm in the diet for 2 years).
Developmental: Laboratory studies with dicamba in pregnant rats and rabbits indicated no evidence of teratology (birth defects).

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Reproduction: A three-generation reproduction study in rats did not show any adverse effects on fertility or reproduction at doses up to 25 mg/kg per day.
Mutagenicity: Dicamba was negative in tests for mutagenicity (the ability to cause genetic damage).

The data reported above are results of animal studies which the Environmental Protection Agency has evaluated in support of the registration of dicamba or which have been evaluated by the Forest Service. These data are used to make inferences relative to human health.

HAZARD: Based on the results of animal studies, dicamba does not cause birth defects, cancer or genetic damage, and has little or no effect on fertility or reproduction. There have been no reported cases of long term health effects in humans due to dicamba exposure.

IMAZAPYR

Pesticide Fact Sheet
Prepared for the U.S. Department of Agriculture, Forest Service,
by Information Ventures, Inc.

This fact sheet is one of a series issued by the Forest Service, the Bureau of Land Management, and the Bonneville Power Administration for their workers and the general public. It provides information on forest and land management uses, environmental and human health effects, and safety precautions for the herbicide imazapyr and its formulations. Unless otherwise stated, the toxicity data presented in this fact sheet refer to the active ingredient, imazapyr. When included, data on formulated products will be specifically identified. A list of definitions is included in Section VIII of the fact sheet.

I. Basic Information

Common name: Imazapyr

Chemical name: 2-(4,5 -dihydro-4-methyl-4-(l-methylethyl)-5 -oxo- lH-imidazol-2-yl) –3 pyridinecarboxylic acid

Common Product names: Arsenal, Chopper, Contain

Pesticide classification: herbicide

Registered Use Status: "General Use"

Formulations: Commercial imazapyr products generally contain one or more inert ingredients. An inert ingredient is anything added to the product other than an active ingredient. Because of concern for human health and the environment, the U.S. Environmental Protection Agency (EPA) announced its policy on toxic inert ingredients in the Federal Register on April 22, 1987 (52 FR 13305). The intent of this policy is the regulation of inert ingredients. EPA's strategy for the implementation of this policy included the development of four lists of inerts based on toxicological concerns. Inerts of toxicological concern were placed on List 1. Potentially toxic inerts/high priority for testing were placed on List 2. Inerts of unknown toxicity were placed on List 3 and inerts of minimal concern were placed on List 4.

For pesticides containing List 1 inerts, the EPA has given the pesticide registrant the opportunity to reformulate the product to remove the List 1 inerts. If the registrant chooses not to reformulate the product, then the List 1 inerts must be identified on the product label. For List 2 inerts, the EPA is monitoring ongoing testing and gathering existing information on the potential adverse effects of these chemicals to determine if further regulatory action is required. The EPA has no particular regulatory plans for List 3 and List 4 inerts. The Forest Service will incorporate new data on inerts into updated fact sheets as it becomes available.

The contents of three imazapyr formulations are listed below.

Chopper: imazapyr (22.6%), isopropylamine (5.4%), and other inert ingredients (72%)

Arsenal: imazapyr (27.6%), and inert ingredients (72.4%)

Chopper RTU: isopropylamine salt of imazapyr (3.6%), propylene glycol (30%), isopropanol (5.0%), and other inert ingredients (61 .4%)

Residue assay methods: Information on residue assay methods is not available.

II. Herbicide Uses

Registered forestry, rangeland, right-of-way uses: non-cropland use for rights-of-way, forestry site preparation and conifer release.

Operational details:

Target Plants: Imazapyr is used to control annual and perennial grass and broad-leaved weeds, brush, vines, and many deciduous trees.

Mode of action: Imazapyr is absorbed by the leaves and roots, and moves rapidly through the plant. It accumulates in the meristem region (active growth region) of the plant. In plants, imazapyr disrupts protein synthesis, and interferes with cell growth and DNA synthesis. Sensitive plants die slowly.

Method of application: aerial methods, low-volume hand-held spray equipment, high-volume spray equipment, boom equipment, basal treatment, cut stump treatment, tree injection, and frill treatment.

Use rates: Use at 2 to 6 pints/acre

Special Precautions: Always read all of the information on the product label before using any pesticide. Read the label for application restrictions.

Timing Of Application: Imazapyr can be applied either before or after weeds emerge. After weeds emerge, imazapyr should be applied during active weed growth. For hardwoods, imazapyr can be applied between leaf emergence and leaf drop.

Drift Control: Do not spray under windy or gusty conditions. Select proper spray nozzles to avoid fine mist. Do not apply near desirable plants or where their roots may extend.

III. Environmental Effects/Fate

Soil:

Residual Soil Activity: Imazapyr can remain active in the soil for 6 months to 2 years.
Adsorption: Imazapyr is strongly adsorbed by soils. It is usually found only in the top few inches of soil.
Persistence and Agents of Degradation: Imazapyr may be broken down by exposure to sunlight Soil microorganisms contribute to the break-down of imazapyr. Very little imazapyr is lost by evaporation.
Metabolites/Degradation Products and Potential Environmental Effects: No information available.

Water:

Solubility: Imazapyr is soluble in water.
Potential For Leaching Into Ground-Water: Imazapyr has a low potential for leaching into ground-water.
Surface Waters: Imazapyr may move from treated areas in streams. Most movement of imazapyr was found in runoff from storms. Use of a streamside management zone can significantly reduce the amount of offsite movement of imazapyr in stormflow. The half-life of imazapyr in water is about 4days. Do not apply on irrigation ditches. Do not apply where runoff water may flow onto agricultural land. Do not apply to water or wetlands.

Air:

Volatilization: Imazapyr does not evaporate easily.

Potential For By-Products From Burning of Treated Vegetation: No information available.

IV. Ecological Effects

Non-Target Toxicity:

Soil Microorganisms: Imazapyr has very little effect on microorganisms.
Plants: Imazapyr is non-toxic to conifers. It is toxic to many other non-target plants.
Aquatic Animals: Imazapyr and its formulations are low in toxicity to invertebrates and practically non-toxic to fish. Imazapyr is not expected to accumulate or buildup in aquatic animals. Imazapyr and its formulations have not been tested for chronic effects in aquatic animals. Acute toxic level:

Species	LC50	Source Table
Fish	<100 mg/l	(Table II, Aquatic)
Water flea	<100 mg/l	(Table II, Aquatic)

Terrestrial Animals: Imazapyr is practically non-toxic to mammals and birds. It is of low toxicity to bees. Imazapyr is rapidly excreted by mammals. Imazapyr and its formulations have not been tested for chronic effects in terrestrial animals. Acute toxic level:

Species	LD50	Source Table
Birds	<2150 mg/kg	(Table II, Avian)
Mammals	4800 to <5000 mg/kg	(Table II, Mammalian)
Bee	<100 micrograms/bee	--

Threatened and Endangered Species: Imazapyr could be a hazard to endangered plants if applied to areas where they grow. It would probably not be a hazard to most endangered animals because of its low toxicity.

V. Toxicology Data

Acute toxicity:

Acute oral toxicity: In tests in rats, the acute oral LD50 was greater than 5,000 mg/kg. (Toxicity Category IV, Table I, Oral)
Acute dermal toxicity: The acute dermal (skin) LD50 was greater than 2,000 mg/kg in rabbits. (Toxicity Category III, Table I, Dermal)
Primary irritation score: The acute dermal (skin) LD50 was greater than 2,000 mg/kg in rabbits. (Toxicity Category III, Table I, Dermal)
Primary eye irritation: In laboratory tests in rabbits, imazapyr was an eye irritant. (Toxicity Category III, Table I, Eye irritation)
Acute inhalation: In laboratory tests in rats, the acute inhalation LC50 was greater than 5.1 milligrams/liter. (Toxicity Category III, Table I, Inhalation)

Chronic toxicity:

Carcinogenicity: The potential for causing tumors (oncogenicity) has not been determined at this time. Laboratory studies are being carried out to determined oncogenicity.
Developmental: Laboratory studies with imazapyr in rats (at dose levels up to 1,000 mg/kg per day) and rabbits (at up to 400 mg/kg per day) indicated no evidence of teratology (birth defects).
Reproduction: The potential for causing adverse effects on fertility or reproduction has not been determined at this time. Laboratory studies are being carried out to determined the potential for reproductive effects.
Mutagenicity: Imazapyr was negative in all tests for mutagenicity (the ability to cause genetic

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damage). The data reported above are results of animal studies which have been evaluated by the Forest Service. These data are used to make inferences relative to human health.

HAZARD: Based on the results of animal studies, imazapyr does not cause genetic damage or birth defects. There is not enough information available at this time to determined whether imazapyr causes cancer, or adverse effects on reproduction or fertility.

Commentor	Comment #	Appendix C Comment/Response for the Vegetation Management Environmental Assessment
Boulder City Open Space	1	**Comment:** Construction of catch fences This option should be considered in areas where the Site is infesting neighboring lands
		Response: Boundary and interior fences do catch weeds before the majority of them leave the DOE property. The future plans include burning these captured weeds at the fence lines.
Boulder City Open Space	2	**Comment:** Research done in Colorado shows mowing multiple times throughout the growing season can reduce Canada thistle significantly. This type of application should be considered in or adjacent to rare plant habitat and areas where other control methods may be restricted. Mowing (via tractor or hand-held equipment) during the growing season followed by a fall application of herbicide (via tractor or hand-held wick) is effective on this particular species. The use of light mowing equipment and attention to seasonal moisture would reduce soil compaction. Mowing in a mosaic pattern also reduces the impact to surrounding native vegetation and maintains wildlife habitat.
		Response: At some point in the future, mowing Canada thistle in this fashion may be incorporated into the integrated weed management strategy.
Boulder City Open Space	3	**Comment:** Tilling may bring weed seeds to the soil surface, and would create good habitat for diffuse knapweed, Russian knapweed and other target species. The soils on the Rocky Flats pediment are generally not conducive to tilling. Drilling seed directly into an untilled site may result in fewer weeds and better conditions for native species establishment. If an area is compacted, then "ripping" the soil surface mechanically before seeding may improve seeding success.
		Response: DOE does not intend to till undisturbed areas. Tilling may be used to prepare previously disturbed areas for reseeding.
Boulder City Open Space	4	**Comment:** We suggest experimental burning of small patches initially (5 to 20 acres) to determine whether thatch removal will enhance or negatively impact conditions for the spread of knapweed. When priority target species exist at lower densities, and are contained in most of the buffer area, and in lands to the west (JeffCo. and COB Open Space, and gravel quarry), then larger burns may be appropriate. Burns should be timed to stimulate warm season species, while not harming native cool season species. Treatment effects monitoring should be an important component of the entire vegetation management plan. Small burns might also provide the opportunity to test the composition of the smoke generated when burning in areas with buried radioactive materials.
		Response: Monitoring of locations after lightning caused burns indicates that fire has had little effect on knapweed - positive or negative. Proliferation in adjacent burned and unburned areas have shown similar amounts of increase in knapweed populations. One of the most probable scenarios would be to burn over an area, allow knapweed plants to germinate, then follow up after an appropriate period with herbicide application to kill the new plants. Others have found that this technique works well because removal of the thatch causes a large portion of the weed seed bank to germinate. The residual effect of an herbicide such as Tordon 22K will inhibit germination of knapweed for several more years, giving the natives a chance

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Commentor	Comment #	Appendix C Comment/Response for the Vegetation Management Environmental Assessment
		take advantage of the recycled nutrients in the ash.
Boulder City Open Space	5	**Comment:** The EA should refer to the recent ESCO Assoc. reports on the "Rocky Flats Bluestem Grassland Study" conducted by ESCO Assoc. and the Rocky Flats Bluestem Grassland study group (reports from 1994, and 1996 through 1998). Areas included in the study are Section 16, the Rocky Flats Buffer area, and City of boulder Open Space tallgrass sites north of Highway 128. The ESCO Assoc. reports describe the uniqueness of the Rocky Flats pediment xeric tallgrass communities, and should be referenced in addition to the CNHP reports.
		Response: We were unable to get a copy of the ESCO report. DOE has had several years of onsite monitoring data to draw upon. This data has helped to identify the problems being addressed by the environmental assessment.
Boulder City Open Space	6	**Comment:** Salt cedar (*Tamarix ramosissima*) and yellow toadflax (*Linaria vulgaris*) should be moved to Priority 1 category. These aggressive weed species are very hard to control once they become established. Small infestations should be addressed immediately. Bouncing bet (*Saponaria officinalis*) should be moved to Priority 2 category.
		Response: This is a valid observation, however *Tamarix ramosissima* occurs as only a single plant at Rocky Flats, and *Linaria vulgaris* is uncommon at the Site. It is *Linaria dalmatica* that is a problem plant at Rocky Flats.
Boulder City Open Space	7	**Comment:** Mowing should be added as a control for Scotch and musk thistle. Mowing is effective on biennials when done at the proper time.
		Response: The current Scotch thistle infestations are so small that a specific mowing effort is unwarranted. The current approach for Scotch thistle is to manually kill every plant found, which at the present level of infestation is still feasible. Mowing musk thistle would be cost prohibitive because of its extent. Biological controls are working very well on this species, and further intervention other than techniques applied for knapweed are not warranted for the present.
Boulder City Open Space	8	**Comment:** Open Space would be interested in any studies that examined the compounds of the smoke that came from plants containing radionuclides when burned.
		Response: Please see references 10, 11, and 14 on the reference list at the end of the environmental assessment..
Cox	1	**Comment:** The DVMEA is deficient because it contains no discussion of the environmental impacts of the herbicides which the DVMEA is proposing for use. The DVMEA needs to include all relevant information about the hazards of herbicides. Until such impacts are included, the DVMEA does not meet its statutory requirements.
		Response: Extensive studies have been conducted on the effects of the use of herbicides by the Environmental Protection Agency, The Department of Agriculture, and other agencies. We have added an

		Appendix B to the environmental assessment which contains excerpts of information from a series of herbicide fact sheets prepared by the U. S. Department of Agriculture.
Cox	2	**Comment:** We wish to point out that pesticide projects in general require an environmental impact statement (EIS), not simply an environmental assessment. We believe that the proposed program does not comply with the National Environmental Policy Act without preparation of an EIS.
		Response: Use of herbicides to control weeds is not an action listed in Appendix D (Classes of Actions That Normally Require EISs) of the Department of Energy NEPA regulations at 10 CFR 1021. We do not believe that the application of approved herbicides following established guidelines will result in a significant impact to the environment.
CDOW	1	**Comment:** It would be better not to bum during the primary bird nesting season so as to avoid destroying nests
		Response: There is no plan to burn during the primary nesting season. Burning would ideally be done in late March to mid-April, which would precede the nesting season for most species.
CDOW	2	**Comment:** The potential effects of a particular bum on the threatened Preble's meadow jumping mouse should be evaluated with the help of the U. S. Fish and Wildlife Service.
		Response: DOE will engage in Section 7 consultation prior such actions that would affect Preble's mouse habitat. However, no burning within Preble's mouse habitat is planned. The maps accompanying the EA specifically excluded Preble's mouse habitat.
CDPHE	1	**Comment:** Use the association of vegetation and soils as a basis to develop specific tailored reclamation practices to create beneficial native habitat. Explore the application of tailored reclamation practices for erosion control site wide.
		Response: Revegetation plans for projects at the Site are specifically tailored to soil type and plant communities. Seed mixtures are developed on a case by case basis to match the surrounding native vegetation community as closely as possible. Specific revegetation techniques have been developed over the past several years to accommodate site-specific conditions.
CDPHE	2	**Comment:** Incorporate tailored reclamation practices for disturbed areas (and in possible caps) to restore them to productive uses in conjunction with the native habitats.
		Response: Restoration of disturbed areas to productive use has been standard practice for a number of years at the site. Any remediation decisions involving caps will incorporate tailored native plant mixtures that meet reclamation goals and protect the integrity of the caps.
CDPHE	3	**Comment:** On page 28 the discussion of controlled burns discusses results of studies to investigate radionuclide content in vegetation. A review of the studies listed here do not conclude that "...plants growing in radioactively contaminated soils absorb radionuclides into their systems": The studies stipulate that "surficial attachment of contaminated soil particles to plants is the likely mechanism of contaminating the vegetation" (Little, 1980). This is definitively different than the inference that radionuclides are taken

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		up into the plants in significant quantities. The resulting statement that there is a "direct correlation between the level of radionuclides in the soil and the level of radionuclide content in the vegetative matter" is therefore somewhat misleading. The washing of plants to remove attached soil and associated radionuclides appears to be somewhat problematic. However, data appears to indicate that the strong correlation between the soil and associated vegetation radionuclide analysis is due to attached material on the plant rather than uptake into the plant.
		Response: The modeling assumptions included all radionuclides, both those in adherent soil, and those that were incorporated into plant tissue. The explanations in the summary were intended to clarify that the different studies had each addressed these burdens a bit differently.
Boulder Co. Open Space	1	**Comment:** You may want to add any revegetation treatments you have implemented for various disturbances on RFETS site. While this does not actively control weeds, it does discourage their ability to establish.
		Response: Revegetation has been ongoing wherever disturbance has occurred or where buildings and structures have been removed. Information describing recent revegetation projects has been added to the environmental assessment. Some examples of recently completed revegetation projects are the C-1 Pond Road, the old landfill, parts of the shooting range, culvert replacement areas in the Buffer zone, the Central Avenue tank removal project, the mound plume treatment trench area, reseeding the OU1 French drain reclamation area, and a few small roadside disturbances that were hand seeded.
Boulder Co. Open Space	2	**Comment:** Scratch Banvel and insert Vanquish. It is a lower volatility version of Banvel and is recommended more often for rangeland. Under Dalmatian toadflax and Scotch thistle chemical control, insert Tordon 22K. Under Scotch thistle, you should also add "Transline" for useful herbicides. Under the "Biological Control" column, for Russian knapweed where it says "livestock grazing": you may want to insert "except horses" since it is poisonous to horses.
		Response: Banvel is used primarily within the Industrial Area or for spot treatments of problem areas rather than on range lands. New herbicides such as Vanquish may be added to the use list periodically as more effective or more environmentally friendly compounds become available.
Boulder Co. Open Space	3	**Comment:** Scratch Russian thistle from the species controlled by Tordon 22K and add Russian knapweed, Dalmatian and yellow toadflaxes, and Canada thistle
		Response: Appropriate changes have been made to Table W-4 in the Environmental Assessment. Tordon 22K appears to be effective on Dalmatian toadflax only at such high dosages, that it kills all other plants, too..
Boulder Co. Open Space	4	**Comment:** I would caution you to not use digging as it prolongs disturbed soil, which, in itself may exacerbate a weed problem.
		Response: Digging is used in limited areas where the infestations are small. It is primarily done to remove individual plants, not as a large-scale technique. Extensive soil disturbances are not intended to be part of

		the weed control strategy.
Boulder Co. Open Space	5	**Comment:** Under prescribed burning, it is important to state that "Burning in weed-infested areas (such as diffuse knapweed) can stimulate germination of weed seedlings, so follow-up treatments with herbicide or hand pulling may be necessary."
		Response: A statement to this effect has been added to the environmental assessment in the controlled burns section.
Feldman	1	**Comment:** In the context of this decision to spray herbicides over a vast area, it is critical that the DOE conduct a more extensive review in the form of an Environmental Impact Statement. To do any less, is to undermine the decision making process and the required steps in a major federal action of this kind.
		Response: Use of herbicides to control weeds is not an action listed in Appendix D (Classes of Actions That Normally Require EISs) of the Department of Energy NEPA regulations at 10 CFR 1021. We do not believe that the application of approved herbicides following established guidelines will result in a significant impact to the environment..
Feldman	2	**Comment:** The Department must consider the potential of herbicides to interfere with the endocrine and/or reproductive systems of wildlife and humans.
		Response: According to the Material Safety Data Sheets for chemicals, which are developed after considerable testing and assessment, the selected herbicides are not shown to have effects on the endocrine or reproductive systems of humans or wildlife.
Feldman	3	**Comment:** To assume adequate testing of the chemicals proposed for use because they are registered by the Environmental Protection Agency is to ignore numerous scientific and congressional reports and to inadequately perform the review function before a major federal action of this kind.
		Response: When herbicides are selected here, EPA approval and available literature on the compound are considered. We feel that the effects of using herbicides have been well tested and documented by the responsible regulatory agencies. The site has performed its own testing of herbicides before electing to use them. Some otherwise promising herbicides have been rejected on the basis of unnecessary risk to surface water or groundwater at this site.
Feldman	4	**Comment:** The draft has not adequately addressed ground and drinking water contamination, especially in light of the fact that the proposed treatment area is within the headwaters of two regional drainage basins.
		Response: No herbicide will be directly applied to ponds or watercourses. In tests following previous ground applications of Tordon 22K, no measurable amount of picloram had migrated to site ponds. CDPHE tests for picloram, and none has been detected in pond water samples. Buffer strips around ponds and watercourses are observed in all the Site plans for herbicide application, and aquatic life is not expected be affected. All herbicide applicators will adhere to manufacturer's labels, which often include recommendations for avoidance of streams and bodies of water.
Feldman	5	**Comment:** The analysis on the affect on wetlands is limited and insufficient.

		Response: As illustrated in the maps accompanying the environmental assessment, there is no intention to broadcast apply herbicides to wetlands, watercourses, or open water. Protective buffer strips will be avoided around sensitive habitat areas. If wick application of herbicide is used (e.g., for Canada thistle in wetlands) the herbicide will be applied by direct contact to specific plants.
Feldman	6	**Comment:** Off-target effects are not adequately evaluated, especially in light of recent studies that show pesticides drift far off of the target site through air currents, rain and fog.
		Response: There will be very specific site controls over the application of herbicide by air, and there are already very specific controls on application by ground equipment. Droplet size is specifically controlled by nozzle aperture, and droplets are kept at large enough sizes that the application is a spray of droplets, rather than a mist that might be transported to non-target areas. Adverse weather conditions, including high wind speeds or rain, will terminate or prevent application. Allowable conditions for wind speeds and precipitation events are specified in the application limitations for each chemical product.
Feldman	7	**Comment:** It is appropriate that the draft document consider the full range of nonchemical options, such as biological controls and cultural practices. However, the nonchemical option should be explored fully in the absence of chemical use. The use of goats as a management tool must also be more fully evaluated.
		Response: The program discussed in the EA considers all reasonably available techniques, including natural biological controls and cultural practices. No one technique is a cure-all, which necessitates the use of combination of control techniques. Goats have gotten a lot of favorable press lately. One drawback to their use at Rocky Flats is they would have to be attended full time. Goats reduce biomass and seed production, but they do kill the weeds. Goats will eat forbs, but do not distinguish between what we consider to be desirable and undesirable plants. Goats work best when they can be fenced into tight quarters where the target noxious weed is dense and provides virtually the only thing they can eat. Herders of weed-eating goats acknowledge that getting goats to eat what you want them to and to leave the rest alone is an inexact art.
Cunningham	1	**Comment:** The riparian areas in this part of the buffer are home to a population of endangered mice (PMJM's) that might be adversely affected by any spraying, burning or mowing activities.
		Response: Burning, mowing, and herbicide application are not planned in Preble's mouse habitat..
Cunningham	2	**Comment:** The use of Tordon near any water course may contribute to the loss of native riparian vegetation in the downstream portions of Coal and Rock Creeks.
		Response: As illustrated in the maps accompanying the environmental assessment, there is no intention to broadcast apply herbicides to wetlands, watercourses, or open water. Protective buffer strips will be avoided around sensitive habitat areas. If wick application of herbicide is used (e.g., for Canada thistle in wetlands) the herbicide will be applied by direct contact to specific plants.
Cunningham	3	**Comment:** If use of Tordon and its effects on riparian vegetation have not been covered thoroughly in the EA, then the DOE would do well to do a more complete study, i.e. a EIS.

Commentor	Comment #	Appendix C Comment/Response for the Vegetation Management Environmental Assessment
		Response: Use of herbicides to control weeds is not an action listed in Appendix D (Classes of Actions That Normally Require EISs) of the Department of Energy NEPA regulations at 10 CFR 1021. We do not believe that the application of approved herbicides following established guidelines will result in a significant impact to the environment.
Seastedt	1	**Comment:** You've confused exotic weed control with restoration ecology.
		Response: The environmental assessment intended to make a clear distinction between the use of controlled burns to enhance and restore grasslands and the use of herbicides to control exotic weeds. See changes to the section on controlled burns.
Seastedt	2	**Comment:** If you're going to use fire as a restoration management procedure, it's important you burn at the time that will favor the dominant species and inhibit the undesirables. If you're attempting to restore the warm season grasses, a late spring burn is preferable to fall or early spring burns.
		Response: The results of monitoring after an accidental burn in an area in the south buffer zone in late March, 1997, helped determine that controlled burns were desirable for the xeric tallgrass prairie on the Site. Warm season species flourished, spring perennials were only lightly damaged, early blooming alien species were destroyed, and musk thistle was heavily impacted. The current planning includes late March to mid-April as the best time to achieve the restoration goals on the xeric tallgrass prairie.
Seastedt	3	**Comment:** Your site has been without fire for a sufficiently long interval to suggest that fire effects may be very different from those grasslands burned more frequently.
		Response: Results of monitoring after accidental burns at the Site in recent years do not indicate a fire response different from other native, fire-adapted grassland communities.
Seastedt	4	**Comment:** It's very important that the relative risks to native biotic diversity be evaluated with regards to treatment. Chemicals have substantial non-target effects, including water quality and human health impacts that seem to have been understated in your report.
		Response:. When herbicides are selected here, EPA approval and available literature on the compound are considered. We feel that the effects of using herbicides have been well tested and documented by the responsible regulatory agencies. The site has performed its own testing of herbicides before electing to use them. Some otherwise promising herbicides have been rejected on the basis of unnecessary risk to surface water or groundwater at this site.
Seastedt	5	**Comment:** it's critical that you have demonstrated that weeds are indeed the critical and immediate threat to the biota. I believe this case can be made for those weeds capable of assuming a monoculture status on Front Range prairies, I've yet to see convincing data that some of your priority 1 weeds fall into this category.
		Response: Language has been added to the environmental assessment to clarify that monocultures of weedy species have become established in some areas of the buffer zone. This does not include all of the priority 1 weed species.

Commentor	Comment #	Appendix C Comment/Response for the Vegetation Management Environmental Assessment
Seastedt	6	**Comment:** EPA's Ecological Effects Branch and Environmental Fates and Groundwater Branches recommended against the re-registration (use) of picloram because its use would pose unreasonable adverse effects to the environment. Specifically, picloram is particularly dangerous because of a. its mobility in soils and persistence under normal ambient conditions b. its high degree of plant toxicity (sensitivity of non-target plants) c. hexachlorobenzene, a known carcinogen, is a contaminant of picloram production. Its persistence and mobility lead EPA to state that "no practical use restriction can prevent it from contaminating the environment surrounding the target site."
		Response: When herbicides are selected here, EPA approval and available literature on the compound are considered. We feel that the effects of using herbicides have been well tested and documented by the responsible regulatory agencies. The site has performed its own testing of herbicides before electing to use them. Some otherwise promising herbicides have been rejected on the basis of unnecessary risk to surface water or groundwater at this site.
Seastedt	7	**Comment:** If chemical weed control is essential, I urge you to use individual weed application techniques on those species of that monoculture. I also urge you to focus on proactive seeding activities at disturbed sites, using appropriate native seeds to match soil moisture conditions. This is a far superior activity to large-area spraying.
		Response: Large scale control of wide-spread weed species will require a broad based approach to achieve noticeable results, in this case aerial herbicide spraying. Revegetation plans for projects at the Site are specifically tailored to soil type and plant communities. Seed mixtures are developed on a case by case basis to match the surrounding native vegetation community as closely as possible. Specific revegetation techniques have been developed over the past several years to accommodate site-specific conditions. If weed infested areas have such degraded native vegetation that the community cannot rebound sufficiently to resist invasion by weeds, overseeding into the area may be implemented to help revitalize the native community.
Sierra Club	1	**Comment:** Biological will not eradicate a species but they can keep the weeds under control given 5 to 10 years of time to take over the site. Is the RFETS willing to permit that?
		Response: The site uses several insects; some have been established since the 1970s. Biological controls that have become well established, and that are effectively controlling weeds at the Site include those specific for musk thistle, Canada thistle, and St. Johnswort. Musk thistle is controlled through infestations of a root borer and a seed-head weevil. The weevils have demonstrably reduced seed production since 1991. The St. Johnswort beetle has also effectively reduced the viability of that plant on the Site. More recently a gall-forming fly and two rootboring beetles for knapweed and a caterpillar for toadflax have been introduced at the Site for testing in cooperation with the Colorado Department of Agriculture. Unfortunately, neither beetle is specific to diffuse knapweed, our wort problem, but they have been helpful

		on spotted knapweed in other areas. Time will tell if they can effectively stress or reduce the target plants. DOE intends to continue to utilize biological controls, but we feel our worst weed problems have surpassed the ability of biologicals to control them.
Sierra Club	2	**Comment:** Page 5, #4 suggests that nutrients added to the soil may give competitive advantage to the weedy species whereas page 27 under "burns" it reads "While burning does not directly control most weeds, it does release nutrients that are tied up in dead plant material, making them available for use by the established plants. " Are we talking about different nutrients here?
		Response: The primary benefit of controlled burning is removal of thatch from grasslands. A complementary benefit is that low concentrations of nutrients tied up in plant tissue are released for recycling directly to established native plants when ash from burning is dissolved by precipitation. Commercial fertilizers contain much higher concentrations of elements than the ash from a controlled burn, and native plants are adapted to soils with low fertility. Introduction of fertilizers can give the faster growing undesirable weed species a competitive advantage over the natives.
Sierra Club	3	**Comment:** Page 26 (paragraph 1) says "230 to 250 acres of land infested with weeds have been treated with herbicides in each of the past 4 years. " Page 6 Table A- 1 says you spray currently approximately 254 acres per year.
		Response: We were unable to find a reference to 254 acres of herbicide treatment in the environmental assessment.
Sierra Club	4	**Comment:** Page 5, #6, the suggestion to mow tall grass prairie to remove vegetation was rejected because the mowed material would add to the thatch. However justification for a burn is that it is natural, has been done in the past and would add nutrients to the soil. One objection was that of soil compaction caused by repeated use of heavy machinery. However a cobbled clay soil probably is not susceptible to further compaction
		Response: Rocky surfaces, uneven ground, steep slopes, and unstable soils would all preclude mowing low enough to remove thatch from around bunchgrasses effectively enough to encourage vigorous growth. Mown vegetation would increase the thatch layer and therefore does not offer any advantage over simply leaving dead plant material standing in the field. This information has been added to the environmental assessment.
Sierra Club	5	**Comment:** We would like to suggest a winter removal, and proper disposal, of dead growth and thatch as a means to: * reduce the fire hazard; * reduce the weed seed bank; * reduce soil pollution levels in areas of high radioactive nuclides; * will expose the soil for further native species germination (weeds also perhaps).
		Response: DOE has not identified an efficient, cost-effective, non-labor intensive manual method of thatch gathering and removal for the 6000 acre buffer zone.
Sierra Club	6	**Comment:** The original mapping of infestations does not address weed density. Are we looking at 1 plant

		per acre, 1 plant per sq. yard, 1 plant per square yard. Knowledge of plant densities can better aid in determining control solutions.
		Response: Infestation areas are classified into general density categories of high, medium, low, and scattered, based on an interpretation of the extent, visual density, need for control, and aggressive nature of the species. In general, a high density category indicates an area that is dominated by a nearly solid infestation of the species. A medium density category was used where the infestation provides less cover and was less homogeneous in the distribution of the species. The low density category is used where the species was present in fewer numbers but was not visually dominating the landscape. The scattered density category is used only in a few cases and indicates a sporadic occurrence of the species. The high, medium, low and scattered categories are not differentiated on the maps. Diffuse knapweed occurs at Rocky Flats with a distribution pattern reflecting its wind-blown dispersal from northwest to southeast across the Site. In general, the highest densities of diffuse knapweed are found in the northwest and central areas of the Buffer Zone, with lower densities found farther east at the Site. Dalmatian toadflax is found in the highest densities on the eastern edge of the Site. The largest high density area is on the pediment north of the east access road where the old radio tower once stood. Sporadic high density areas are also found at several locations in the south Buffer Zone. Scotch thistle has been found at six locations scattered across the Site. Some locations had only a few scattered individuals along roads. One location, however, had a few hundred plants across 1-2 acres.
Sierra Club	7	**Comment:** Page 26 concerning radionuclide concentration in the plants on site lacks a resources list "(add citations)" but citations are not there. The document lacks any resource listing and also information on what monitoring will be done in the future.
		Response: A reference list has been added to the environmental assessment. Information has also been added to the environmental assessment to describe the monitoring that is conducted to assess the effectiveness of vegetation management actions.
Sierra Club	8	**Comment:** Page 4, # 1 catch fence construction. Although the property borders have fences it still may be wise to construct some fences to prevent weed encroachment on the Preble's meadow jumping mouse habitat. Nowhere in the statement is any special emphasis given to prevention of weed growth on PMJM habitat.
		Response: Catch fences would be used to control the movement of species that distribute their seed by blowing across the ground, such as diffuse knapweed. Diffuse knapweed does not grow in wet areas, and generally DOE has not found it encroaching in mouse habitat.
Sierra Club	9	**Comment:** Page 4, # 2 soil inoculation may not be proven in open range but has been successfully demonstrated in agricultural approaches. Further exploration of this issue needs to be addressed since a later statement in the document supporting burning suggests that nutrient enrichment would serve a useful purpose

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		Response: Inoculation in agriculture involves placing microorganisms into the soil at the same time seed is planted. The microorganisms form a symbiotic relationship with plant roots and improve the plant's ability to extract nutrients from the soil. Rangeland plants have evolved in soils of low fertility, and in many cases have formed natural symbiotic relationships with the mycorrhizal fungi available in the soil. DOE does not anticipate tilling large areas of the buffer zone to plant seed.
Sierra Club	10	**Comment:** Page 4, # 3 wash vehicle tires. If this is not feasible perhaps converting your off road vehicle fleet to motorcycles or some smaller vehicle less likely to transport weed seeds would be appropriate. Perhaps the use of bald tires as a way to prevent vehicles from transporting weed seeds would help.
		Response: The proposal to wash vehicle tires was intended to prevent new species from being brought into the buffer zone and slow the spread of on site species. The weeds infesting the largest acreage are distributed by wind, and their spread would not be hindered by washing vehicle tires.
Sierra Club	11	**Comment:** Page 5, # 7 grazing animals. You suggest possible negative impacts to PMJM habitat, however possible negative impacts from burning, pesticides and other proposed changes in management do not address negative impacts on PMJM. What effects would pesticides and burns have on PMJM habitat?
		Response: Burning and herbicide application are not planned in Preble's mouse habitat.
Sierra Club	12	**Comment:** Under "Revegetation," the current program is that 1-35 acres will be revegetated and the proposal will include 1-70 acres. This does not seem like very much.
		Response: There is very little disturbed acreage in the buffer zone except as a result of remediation activities. Revegetation is performed in areas where building removal or remediation activities have exposed fresh soil. There is not a large backlog of disturbed acreage waiting to be reclaimed.
Sierra Club	13	**Comment:** Under "Herbicide Application," the current program is 260 to 265 acres annually and the proposal includes 1770 to 1780 of the 5800 acres total annually. For how many years will the spraying continue? Will monitoring of weed density be done to confirm there is an actual decrease in plant cover? Broadcast spraying is best done only in densely populated weed infestations. How many acres of the Rocky Flats weed infestations meet this criterion?
		Response: The amount of acreage that would be treated in out years will depend upon the success of treatment. Monitoring and evaluation will determine the need for re-treatment. Studies of the control of diffuse knapweed suggest that herbicides will need to be reapplied every 3 or 4 years until the seeds lying dormant in the soil have sprouted and been killed.
Sierra Club	14	**Comment:** Under "Mechanical mowing," there are no changes in mowing 10 miles of roadsides annually - how much roadside area is there in the property? Under "Road Grading," no change to the grading of 25 miles of road annually. How many miles are there total?
		Response: Roadside mowing occurs along ten miles of improved roads at the site for purposes of safety, aesthetics and weed control. There are about 25 miles of graded gravel roads in the buffer zone and a similar amount of "two-track" roads that are used very lightly and not graded.

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Sierra Club	15	**Comment:** Under "Hand Pulling, "there are no changes on the less than 4 acres per year we would suggest that for the low density infestations, hand pulling maybe the practice of choice for weed control.
		Response: Hand pulling would be one of the methods of choice to control small infestations of noxious weeds. Hand pulling is not efficient for infestations that cover a large acreage.
Sierra Club	16	**Comment:** Are you doing any revegetation to prevent further weed infestations?
		Response: DOE revegetates acreage that is disturbed as a result of remediation or maintenance work in the buffer zone. This amounts to about 35 acres per year currently.
Sierra Club	17	**Comment:** Under "Cultural," there is no change in the proposal to reseed disturbed areas. Is this including all the graded roadsides?
		Response: The estimated acreage of disturbed areas that would be reseeded does not include roadsides.
Sierra Club	18	**Comment:** Under "Prescribed Fires," flaming of the green rosettes is a further way to deal with biennials. This includes a quick heating of the plant and bursting of the cells and is a viable way of dealing with plants in ditches and gullies that maybe encroaching on PMJM habitat. However, we are concerned about the problem of radioactive material that has been taken up by the plants being released into the airshed. This is a problem that must be addressed if burning is to be used for vegetation management.
		Response: DOE conducted an assessment of the radiation dose that would be received by site employees and offsite residents as a result of controlled burning of vegetation on contaminated soils. The assessment concluded that workers tending the fire would receive a dose of 0.017 millirems and the nearest residents would receive a dose of 0.0029 millirems.
Sierra Club	19	**Comment:** Scotch thistle as a priority 1 weed. I have worked an area where we were able to eradicate this weed through annual digging or pulling out the root before the bloom matured. It took three years with periodic reviews thereafter.
		Response: DOE hopes to accomplish the same result with the present digging/pulling/cutting approach being used to control this species. Since this plant can become a very large problem once it is established, we are manually removing all the plants we can find.
Sierra Club	20	**Comment:** What monitoring protocols and efforts will be made? How will decisions be made on the future management techniques to be used? Will there be a public process? Will vegetative data on the property be available for the public to review?
		Response: DOE plans to continue the established vegetation monitoring programs. Decisions will be based on the results of monitoring the effectiveness of weed control actions. The monitoring program and the results will be discussed in the annual vegetation monitoring reports which are available to the public in the Rocky Flats reading rooms.
Sierra Club	21	**Comment:** The document lacks the defining criteria for decision making on future weed work. There is no way to predict what will be done where and when from reading this document.

		Response: The environmental assessment was prepared to evaluate the impacts of the options available for use in the buffer zone. Based on the results of the environmental assessment, a vegetation management plan of specific activities will be developed and updated annually. The activities in the plan will be drawn from those described in the comprehensive action alternative, although the acreage and locations of activities will vary from year to year.
Sierra Club	22	**Comment:** We would suggest that it is better to do multiple small buffer/border pieces of property well rather than to throw all resources and money into the total property only to see it revert back to its original weedy mess in a few years down the line.
		Response: The time for small efforts to control most priority 1 species has passed. The problem has become too extensive, and aerial application of herbicide is needed to control these weeds on the large areas that are infested. Weed control measures will not be a one time occurrence. Monitoring and evaluation will help determine the need for subsequent measures to prevent the property from reverting to the current condition in the future.
Sierra Club	23	**Comment:** The "Biological" section says you are introducing one new species of insect per year. According to BioIntegral Resource Center, on knapweed it takes 5 to 10 years for knapweed-specific species to take hold and have an limiting effect on seed production and plant growth. Which insects are currently on site? How long has each species been there? What impact will periodic pesticide spraying or use have on those biological that may not be completely established or, for that matter, on the biological that are already established?
		Response: The site uses several insects; some have been established since the 1970s. Biological controls that have become well established, and that are effectively controlling weeds at the Site include those specific for musk thistle, Canada thistle, and St. Johnswort. Musk thistle is controlled through infestations of a root borer and a seed-head weevil. The weevils have demonstrably reduced seed production since 1991. The St. Johnswort beetle has also effectively reduced the viability of that plant on the Site. More recently a gall-forming fly and two rootboring beetles for knapweed and a caterpillar for toadflax have been introduced at the Site for testing in cooperation with the Colorado Department of Agriculture. Unfortunately, neither beetle is specific to diffuse knapweed, our wort problem, but they have been helpful on spotted knapweed in other areas. Time will tell if they can effectively stress or reduce the target plants. DOE intends to continue to utilize biological controls, but we feel our worst weed problems have surpassed the ability of insects to control them.
Sierra Club	24	**Comment:** It is too bad this order (Integrated Pest Management) was not fully addressed in the EA.
		Response: Integrated pest management includes control of weeds, rodents, insects and other pests. This environmental assessment and the corresponding vegetation management plan address weed control but do not address the control of other pests. This environmental assessment evaluates the effects of integrating several vegetation management techniques.

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Sierra Club	25	**Comment:** We need an EIS for this project because there are apparent internal inconsistencies within the draft report, it lacks sufficient data, and it does not fully address the weed control problems of the application site.
		Response: Use of herbicides to control weeds is not an action listed in Appendix D (Classes of Actions That Normally Require EISs) of the Department of Energy NEPA regulations at 10 CFR 1021. We do not believe that the application of approved herbicides following established guidelines will result in a significant impact to the environment.
Sierra Club	26	**Comment:** The problems associated with release of radioactive materials with burning vegetation have not been addressed.
		Response: DOE conducted an assessment of the radiation dose that would be received by site employees and offsite residents as a result of controlled burning of vegetation on contaminated soils. The assessment concluded that workers tending the fire would receive a dose of 0.017 millirems and the nearest residents would receive a dose of 0.0029 millirems. The results were included in the environmental assessment.
City of Arvada	1	**Comment:** The accumulation of dead, dry vegetation throughout the buffer zone and the potential for warm, dry, windy meteorological conditions raise serious concerns in Arvada over the risk of wild fires. Therefore the City of Arvada supports DOE's proposal to implement controlled burning throughout uncontaminated areas of the buffer zone as part of its vegetation management program as soon as possible.
		Response: DOE anticipates that controlled burns will be conducted primarily in the short grass and tall grass prairie communities in the uncontaminated portions of the buffer zone. We also feel that the results of the dose assessment prepared to evaluate doses to workers and nearby residents shows that a controlled burn could be safely conducted in contaminated areas of the buffer zone.
City of Arvada	2	**Comment:** We request that you investigate the possibility of including the State Land Board property (Section 16) in the vegetation management program.
		Response: DOE is willing to cooperate with the State Land Board or the current lessee of Section 16 on vegetation management initiatives. DOE has no authority for control of the property.
City of Arvada	3	**Comment:** We request that DOE actively investigate methods to minimize the use of chemicals. We also request that you thoroughly investigate any and all possible negative impacts or side effects of herbicide use. Please determine and discuss short and long-term effects of short and long-term use of herbicides.
		Response: When herbicides are selected here, EPA approval and available literature on the compound are considered. We feel that the effects of using herbicides have been well tested and documented by the responsible regulatory agencies. The site has performed its own testing of herbicides before electing to use them. Some otherwise promising herbicides have been rejected on the basis of unnecessary risk to surface water or groundwater at this site.
City of Arvada	4	**Comment:** We are particularly concerned about aerial application of herbicides given the typically windy conditions at RF. The VMEA does not provide adequate information to evaluate your proposed herbicide

		application program. We urge you to pursue alternatives to aerial herbicide spraying, such as biological and mechanical management methods.
		Response: There will be very specific site controls over the application of herbicide by air, and there are already very specific controls on application by ground equipment. Droplet size is specifically controlled by nozzle aperture, and droplets are kept at large enough sizes that the application is a spray of droplets, rather than a mist that might be transported to non-target areas. Adverse weather conditions, including high wind speeds or rain, will terminate or prevent application. Allowable conditions for wind speeds and precipitation events are specified in the application limitations for each chemical product. The alternatives in the environmental assessment were designed to represent the maximum level of activity that would occur in any one year. The annual vegetation management plan updates will describe the specific management plans for each year.
City of Arvada	5	**Comment:** We request that you involve the Arvada Fire Protection District in any activities that include controlled burns and in the consideration of the risk of wild fires.
		Response: Controlled burns will include public information and cooperation with local municipalities, counties and other agencies.
Jefferson Co. Nature Assn.	1	**Comment:** Inasmuch as parts of the buffer zone have not been grazed for several decades, periodic burning can be an important means to eliminate noxious weeds, and stimulate native grasses. We heartily endorse use of burning on buffer zone grasslands in order to accurately assess its impact on native grasslands.
		Response: None required.
Carpenter	1	**Comment:** It is abundantly clear that fire is a key ecological process in grasslands such as those that occur at Rocky Flats. Without fire, the grasslands at Rocky Flats may become decadent with excessive build-up of plant litter and a concomitant decline in the diversity of native plants and animals that have adapted to periodic burning over the millennia.
		Response: This comment confirms our own conclusions.
Carpenter	2	**Comment:** It is also clear that prescribed burns can be conducted safely and with the support of the public if steps are taken to inform people about the benefits of prescribed burning and the extensive planning that precedes each prescribed burn.
		Response: DOE plans to keep interested partied informed of plans at the site.
Westminster	1	**Comment:** We are concerned that only 250 acres in the buffer zone receive yearly herbicides, manual or mechanical removal and biological controls to control the spread of weeds at the Site. A much more aggressive plan for the entire buffer zone should have been developed several years ago for this area.
		Response: The time for small efforts to control most priority 1 species has passed. The problem has become too extensive, and aerial application of herbicide is needed to control these weeds on the large areas that are infested. Weed control measures will not be a one time occurrence. Monitoring and

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		evaluation will help determine the need for subsequent measures to prevent the property from reverting to the current condition in the future.
Westminster	2	**Comment:** The Alternatives analysis states that it is likely that the techniques described in any alternative would not all be implemented in the same year due to budget constraints. This would seem to delete the option of combining a large number of vegetation management techniques that would be implemented in an integrated fashion.
		Response: DOE anticipates that we will be able to implement a combination of the weed control and range enhancement techniques described in the comprehensive action alternative every year. The reference to budget constraints has been removed from the environmental assessment.
Westminster	3	**Comment:** The City of Westminster does not support controlled burns as a method of weed control at Rocky Flats. We understand that this is a nationally accepted method for land management, however, a radionuclide-contaminated site such as Rocky Flats should not be considered for the burning method.
		Response: DOE anticipates that controlled burns will be conducted primarily in the short grass and tall grass prairie communities in the uncontaminated portions of the buffer zone. We also feel that the results of the dose assessment prepared to evaluate doses to workers and nearby residents shows that a controlled burn could be safely conducted in contaminated areas of the buffer zone.
Westminster	4	**Comment:** We would urge the Department of Energy to use the current methods of control but applied in a much more aggressive fashion. The amount of acreage treated could be doubled to 500 acres per year. This is the same amount of acreage that you are now considering for a burn.
		Response: The time for small efforts to control most priority 1 species has passed. The problem has become too extensive, and aerial application of herbicide is needed to control these weeds on the large areas that are infested. Weed control measures will not be a one time occurrence. Monitoring and evaluation will help determine the need for subsequent measures to prevent the property from reverting to the current condition in the future.
Westminster	5	**Comment:** Mowing tall grass prairie to remove vegetation to cut down the weeds and the upright portions of previous years growth of native vegetation will slow the accumulation of fuel load. The cut portions should be gathered and removed. The Departments explanation for not pursuing this option is not clear. Soil disturbances from driving equipment repeatedly across the ground is not a valid reason to exclude seasonal mowing and removal of cut vegetation as a weed control option. This type of procedure is used extensively on roadsides, parks, golf courses etc.
		Response: Rocky surfaces, uneven ground, steep slopes, and unstable soils would all preclude mowing low enough to remove thatch from around bunchgrasses effectively enough to encourage vigorous growth. Mown vegetation would increase the thatch layer and therefore does not offer any advantage over simply leaving dead plant material standing in the field. This information has been added to the environmental assessment.

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		Attempting to bale or otherwise gather cut material from 6,000 acres, even if it could be effectively mowed, would be an enormous task, and would generate a prohibitive amount of material that would have to be disposed of. This approach would not be an ecologically sound because there would be constant removal of plant nutrients from the ecosystem. This would eventually degrade the very prairie grasses the program is attempting to conserve and sustain.
Westminster	6	**Comment:** Use of grazing animals such as goats, which can be kept in specific areas with portable fencing, should be considered as part of the comprehensive vegetation management plan. Goats prefer grazing on weeds.
		Response: The program discussed in the EA considers all reasonably available techniques, including natural biological controls and cultural practices. No one technique is a cure-all, which necessitates the use of combination of control techniques. Goats have gotten a lot of favorable press lately. One drawback to their use at Rocky Flats is they would have to be attended full time. Goats reduce biomass and seed production, but they do kill the weeds. Goats will eat forbs, but do not distinguish between what we consider to be desirable and undesirable plants. Goats work best when they can be fenced into tight quarters where the target noxious weed is dense and provides virtually the only thing they can eat. Herders of weed-eating goats acknowledge that getting goats to eat what you want them to and to leave the rest alone is an inexact art.
Jefferson Co.	1	**Comment:** The Comprehensive Action Alternative offers the best chance at accomplishing noxious weed management and/or control at the site. By utilizing an integrated approach, the potential for success is magnified. Either of the other two alternatives would contribute to the expansion of noxious weed populations at the site and would further degrade the unique ecosystems and species diversity found there.
		Response: DOE anticipates that we will be able to implement a combination of the weed control and range enhancement techniques described in the comprehensive action alternative every year.
Jefferson Co.	2	**Comment:** Emphasis should be placed on aerial spraying in those areas of the site where other application methods would degrade the soil surface or where radionuclides are could be disturbed.
		Response: DOE wishes to have the option of utilizing aerial spraying in all suitable locations in the buffer zone.
Jefferson Co.	3	**Comment:** When used as instructed by EPA registered herbicide labels and under favorable conditions, aerial application is an effective method for vegetation management.
		Response: This comment confirms our own conclusions.
Jefferson Co.	4	**Comment:** Increasing the use of biological control insects where higher levels of radionuclides are present on in biologically sensitive areas of the Site may help slow the spread of noxious weeds in those areas. Additionally, I would recommend increasing the overall number of releases of biological control insects.
		Response: DOE intends to continue to use biological controls at the Site. The host weeds for the insects may or may not be located in radiologically contaminated areas. The number of insects released annually

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		may be increased after some of the weed populations have been reduced to more manageable levels.
Jefferson Co.	5	**Comment:** I would recommend including a statement within the Comprehensive Action Alternative that addresses the use of additional integrated vegetation management techniques when they become available and if they are appropriate to the Site.
		Response: New vegetation management techniques may be investigated in the future for use at Rocky Flats. If the new techniques are substantially different from the techniques that have been evaluated in the environmental assessment, and they have the potential for resulting in environmental impacts, they would require a separate assessment.
Jefferson Co.	6	**Comment:** I would recommend including a component that outlines how all the techniques which are used will be evaluated for effectiveness.
		Response: Information has been added to the environmental assessment to describe the monitoring that is conducted to assess the effectiveness of vegetation management actions.
Jefferson Co.	7	**Comment:** Those weeds whose populations are small and controllable should be included in the Priority 1 category. Those weeds that pose a higher threat of expansion due to the nature of their dispersal (ie: Houndstongue and Russian Thistle) should also be included in a category of higher priority.
		Response: Weed species at the site have been prioritized according to the severity of the problem they currently pose or the severity of the problem they potentially pose if they get a foothold. The prioritization follows a process is in the form of a risk assessment similar to that developed by the National Park Service. DOE intends to apply control methods to species currently characterized as lower priorities, but our efforts will be concentrated most heavily on priority 1 species.
Jefferson Co.	8	**Comment:** A statement needs to be included that addresses the potential for newly introduced weed species and the need to control them.
		Response: The Weeds section of the environmental assessment states that there may be a need to apply controls to newly introduced weedy species at the site if they become residents.